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MOLLUSCA.

TESTACELLIDÆ AND ZONITIDÆ.

BY

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AND

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PREFACE.

The present short volume of the 'Fauna of British India' series deals with the families Testacellidæ and Zomitidæ of the Indian Land-Mollusca. This account of these two important families of land-shells is founded on the all too short manuscript left by the late Dr. Blanford, who in it had dealt with the shells chiefly from the conchological side. It was fortunate therefore that Lt-Col. Godwin-Austen, whose unique knowledge of Indian Mollusca is well known to students of the Indian Fauna, willingly consented to take up and complete the malacological part required for the volume. This, however, necessitated a re-arrangement of the MS. and a considerable amount of further study and dissections, all of which retarded the publication of the work.

C. T. BINGHAM.

London, June 1908

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INTRODUCTION.

By the death of Dr. W. T. Blanford, the late talented Editor of the 'Fauna of British India' series, the writing of the Introduction to this volume has devolved on me

Up to a few days of his death, 23rd June, 1905, Blanford was engaged on this the first volume on the Indian Mollusca, and it was with bitter regret he feared he could scarcely be spared to complete it. It saddens me now to think that, perhaps, had I been able to go up to town oftener in those days and help, the work might have progressed faster, but I could not neglect duties

in the country.

On commencing the work, now some years ago, Blanford asked me if I would assist him in the malacological part while he undertook the conchological. With regard to the latter, I may safely say there was then no man living who knew the Indian Land-Shells and their distribution better than Dr. Blanford, to which he added an intimate knowledge of the external form of the animal. In a Field Note-book of his I have found many valuable drawings and descriptions made from life and have used some in this work. In going over his manuscript I could not but see what long and laborious work it had entailed with the constant use of the microscope as the fresh descriptions of the shells were written

Since 1877 I have been constantly at work on the internal anatomy of the Indian land-shells, having brought home a large collection preserved in spirits. To gain some further knowledge, particularly of the range of genera, I examined all the material I could obtain from Borneo and the Malay Archipelago, the Mascarene Islands, Socotra, and Africa. The results of this have been published from time to time. Many species obtained by Blanford during the last two or three years of his life he placed in my hands for examination, so that the generic position of a large number of forms is now very fairly arrived at.

It is a great loss to science that Blanford did not live to put together his full and matured ideas on distribution, phylogeny, &c He was eminently fitted to do this by his extensive knowledge of the country, his powers of observation, and his studies in other branches of the animal kingdom. I, who really took up the collection and study of land-shells at his instigation and owe much that I have learnt to him feel far from equal to the

task

With regard to the shells merely, there is very little more to be made known, but a reclassification of the family Zonitide, based upon all the characters of the animal and the shell combined, is very desirable. There is so much to be done that it seems even now somewhat premature to bring out this volume, the more so as it deals principally with the above-mentioned family and because our knowledge of the Pulmonata (the Land-Mollusca of India) is far behind our knowledge of any other group among the Invertebrata. This is due to the fact that until comparatively recently the shell only, and not the animal that constructs it, has been taken into consideration. It is well known that the building up of the shell is a process performed invariably in the

same way by one part of the animal.

These neglected forms of life are found by those who will examine them to differ, generically speaking, widely one from the other. It will be seen in the following pages that a very large number of them have never been examined at all, so that it 15 still doubtful to what genus many of them should be assigned. Any satisfactory conclusion therefore regarding their phylogeny is impossible and regarding their distribution most uncertain. In examining the shells alone we find in several genera these are so extremely alike, the differences so subtle that the eye fails to appreciate them. Again, the uncertainty regarding habitat is increased in some cases by the types being lost, in others by the doubtful authenticity as to habitat of their representatives in museums Occasionally three different species may be found in one tablet under the same name, and these from two or more localities In such cases it is only by collecting de novo in the localities where the types were procured that we can be certain of absolute and true identification

Only the families Testacellidae and Zonitidae are included in this volume.

The classification adopted has been that employed in the manuscript left by Dr W T Blanford, which was the subject of many conversations and constant correspondence with him I conclude he based it upon the classification used by Paul Fischer in his 'Manuel de Conchyhologie' (1887), one which has to some extent been adopted in the arrangement of the molluscan collections at the Natural History branch of the British Museum With regard to the different genera Dr Blanford had worked through, the order in which some had to be placed had yet to be decided, the last morning's work we did together when he was staying with me at Noie, 7th May, 1905, had reference to this very point

I have given very considerable thought to this question of classification and adopted a sequence which is as natural, I trust, as our limited knowledge of the animals at the present time will permit and as consonant as I can now make it with Blanford's

views

Blanford left the descriptions of three new genera, and I have

thought fit to create three more, for the reception of certain species which had points in their anatomy differentiating them

from the species with which they had been placed.

In that very specialized division of the animal kingdom, the Land-Mollusca, and particularly in the family Zonitide, great uniformity of the general main structure obtains with at the same time very remarkable variation of the several parts, particularly those of mastication and generation; it may be safely said that in some genera a greater amount of variation is met with in the internal organs than is to be found in the form of the shell. When we come to compare molluscous animals from far distant parts of the world, either proceeding from east to west, or from the Northern to the Southern Hemisphere, we find each land-area has its own distinctive set of genera. Fossil evidence again shows some have had in the past a much more extended range, and it becomes evident they have gone through a remote, extremely slow, and separate evolution. This is, after all, not so remarkable when the great antiquity of the Pulmonate Mollusca is considered. landshells extremely like those of the present day go back to the Palæozoic period, being first known from the Devonian, and together with other life on the earth demand many subsequent eras for their specialization.

While the Vertebrates have been classified scientifically by their internal anatomy, Invertebrates such as the Mollusca have received comparatively desultory notice. For this reason Dr Blanford in arranging for the publication of a volume on the Land-Mollusca decided to incorporate all that was known of the

anımal.

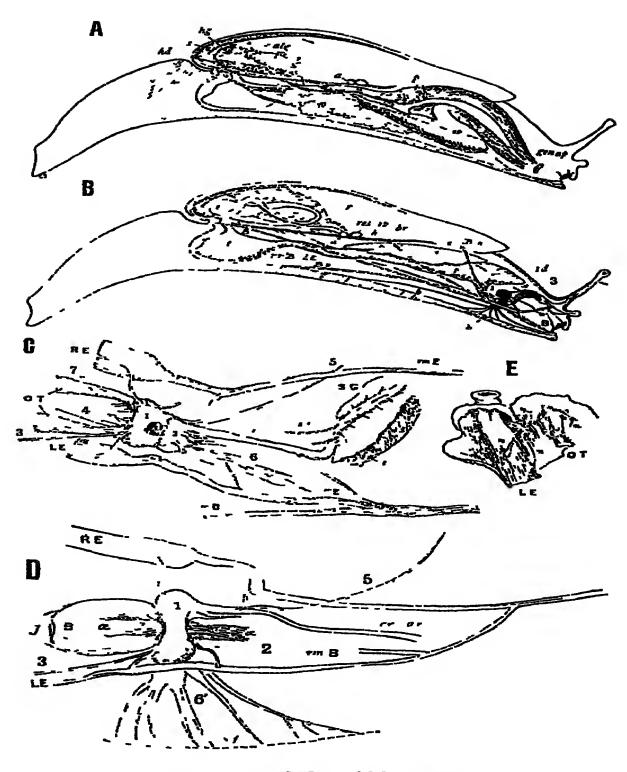
Many years must elapse before the necessary material can be got together to elucidate and advance the knowledge of the generic relationship of these Indian land-shells. In the case of the Zonitidæ, it happens a large number of very fragile shells are found differing very slightly from each other in shell-character, yet on examination of the animal such marked differences are presented that they have to be placed in separate genera; in fact satisfactory determination is quite uncertain without a knowledge of the animal

Space will not admit of dealing with the anatomy in any great detail, I have therefore only attempted so much as seems desirable to give the collector some idea of the position and function of the different parts, from which he will more readily understand that the shell alone is of very uncertain value in all questions relating to phylogeny or relationship, evolution, and range in connection with problems relating to the former distribution of land and sea.

BODY AND FOOT.

Animal soft and flexible, covered with an epidermis which in the land forms secretes much mucus from an elaborate system of not only mucous, but sensory and pigmentary glands, rendering

62



1 1g 1 - Girasio hookert Silchar, Cachar

the surface moist and acutely sensitive to touch and smell There is no internal bony skeleton assisting in the movements of the animal, all action is produced by a beautiful contractile and protrusive muscular system, one part as it were pulling

against and acting on the other.

In the Mollusca the primitive plan of structure was a body symmetrical to a median vertical plane, the alimentary canal running from the mouth at one end to the anal aperture at the This body had a lower vential or neural face, an upper dorsal or homal face, and a right and left side. Only in a few of the Mollusca has this symmetry of the body been retained undisturbed, as in the very aucient classes Amphineuia, Scaphopoda, and Pelecypoda, and the hamal face is not produced into a visceral sac; but in the great majority of mollusks such a visceral sac is found. In the Gasteropoda the ventral face gives rise to a muscular foot The structure of this foot is important; it shows considerable modification, which renders it of much value in classification, according as it has been modified for digging, swimming, or creeping as in the land forms

The dorsal face is generally produced at its margin into a free fold, called the mantle or pallium, derived from the primitive

Explanation of Fig. 1.

- A Diagrammatic view of right side, to show the position of the generative organs within the body-cavity and that of the rudincentary shell About nat. size
- B Similar view, to show the position of the nervous ganglia and a few of the nerves radiating from it, also to show the general plin of the musculir system, a tew of the main unuscles at the position of their attachment points, the buccal mass and alimentary system with the salivary glands, and the position of the branchial chamber and percardium About mit
- C The cerebral and pedal gaugha with some of the various nerves, together with the main inuscles of the buccal mass and eye-tentacles Viewed from above, laid out. Drawn under microscope. × 45
- D The same, drawn by eye, showing the nerves to iniddle of the foot (6') and position of the buccal mass and esophagus Viewed from above
- E The left eye-tentacle and oral tentacle, severed from the part in C Viewed from the maide, showing the small retractor basal muscles (m)
- RE Right eyo-tentacle LE Left eye-tentacle OT Oral tentacles SG Salivary glands ed Salivary ducts rm E Retractor muscles of eyetentacles rm B Do of buccal mass. r Renal organs
 1 Intestine covered by salivary Jan Heart

auf ar Anterior artery

- s f. Side of foot B Buccal mass
- æ Œsopbagus m Muscles
 - 1 Cerebral ganglia Pedal ganglu
 - 3 Nerve to buse of left eyetentacle
 - Nerves to lips
 - Do to posterior right side of fout
- Do to basal edge of foot.
 - 7 The position of the otocysts

shell-gland, the edges of which secrete and form the shell Between the mantle and the rest of the body is a cavity, the pallial chamber, the seat of the respiratory organs, which may consist of gills (branchio), or, as in the Pulmonates, of a sort of lung formed by a network of blood-vessels developed on the roof. The pallial margin forms a complete zone with only a small aperture for respiratory and excretory purposes, and thus the mantle becomes divided into lobes, an anterior left and a posterior right, the dorsal lobes being below them

right, the dorsal lobes being below them
Gasteropods with conical or spiral shells, with gills placed in
front of the heart, and sexes distinct—that is to say, nearly all the
marine and a large series of terrestrial genera—belong to the order

Prosobranchia.

In the Pulmonata, with which this volume deals, the mantle is large as well as the unsymmetrically coiled visceral sac, in which the intestines, liver, and part of the genital organs lie. The mantle-cavity lies on the fore part of the sac, and the anus (a) opens at its margin, generally on the right side. Thus in all the ordinary Pulmonata the end of the intestine is twisted from its primitive position at the hinder end forwards to the right dorsal

side of the body.

In the cephalic area all the organs of sense are situated, the common generative aperture lying on the right side at a varying distance behind the right eye-tentacle. The head or prosoma is symmetrical, bearing on the upper side two cylindrical, tapering, hollow, reversible tentacles, with swollen or bulbous tips carrying the eyes, also two much shorter below them, the oral, both pairs are contractile within the body-cavity. On the anterior ventral side is the mouth, with the more or less solid jaw above and visible externally. The radula with its teeth below is not usually seen unless when protruded. The mouth is quite distinct from the respiratory system and is used for feeding only. The upper lip has a ring of rounded tubercles on its edge, the lower lip is simpler and more fleshy, but in certain carnivorous forms the corners are produced into lappets

The pedal area consists of the muscular foot or podium, and is characteristic of the Land-Mollusca and all Gasteropods. It varies greatly in size and form in different genera. When fully extended the portion behind with respect to the shell or visceral sac may be very short, that in front very long, or they may be equal in length. It may be either narrow or broad and flat, almost circular, possessing thus great power of adhesion to the surface on which the animal rests. The foot-sole in the Cyclostomide is divided longitudinally into two portions, and the animal crawls by advancing the halves alternately. The sole has either a smooth uniform surface or it is divided into three nearly equal parts (trifasciate) longitudinally, the central area being the true ambulatory one. This is the type generally found in genera of the Zonitide, and has as well, on the outer side of the foot, a border broken up into segments by lines giving it a fringed appearance

Above this are the very pronounced parallel peripodial grooves, generally two, in a few cases three, broken into oblong spaces (vide fig. 38, A, p 75) The rest of the body is covered with papillate tubercles or fine rugosities, separated by deep grooves leading from the upper peripodial groove towards the dorsum of the foot. The Zonitide also have a conspicuous caudal mucous gland variously formed (fig 57, C, p 159) The upper surface of the foot behind may be keeled above, but it is generally rounded.

Even in those genera of the Zonitidæ, such as Girasia (fig. 1, A, B, p. xx), where the shell has been reduced to a mere membrane, the foot never reaches the true slag-like stage found in Limax, Arion, &c, in which genera the viscera fill the whole foot to its extreme posterior point, or rather the visceral hump is spread over the whole dorsal surface of the creeping-organ. The foot in the Eastern forms of Zonitidæ is solid in form, and their other anatomical details present so great a similarity to the component parts in the shell-bearing genera from which they have descended, that they furnish closer links in a chain of evolution than is often to be met with.

THE MUSCULAR SYSTEM.

The greater mass of the body is a network of muscular tissue most perfect and complicated. The larger muscles are very tough, ribbon-like, smooth, and shiny. The largest is the shell-muscle attaching the animal to the shell, and most of the stronger most important muscles are given off from it. In those species where there is only a remnant of a shell and no columella the attachments of the principal muscles he around the thickened mantle-edge, principally on the posterior margin; these include the buccal retractor and the retractors of the foot and eye-tentacles (fig. 1, B, C). Some 4 or 5 fine muscles lead from the sides of the mouth and pass through the nervous collar in a posterior direction. There is a localized series in the buccal mass known as the depressor, protractor, and levator muscles.

THE NERVOUS SYSTEM.

The main mass of the nervous system is situated just behind the buccal mass (fig. 2, b, p 3) and mouth, forming a ring or collar (cg) (fig. 4, ng, p. 4), through which the alimentary canal passes posteriorly. It is made up of paired ganglia, more or less united by commissural bands completing the collar. According to their position above or below the esophagus (c), they have been termed the cerebral or supra-esophageal; the pedal with the visceral or parieto-splanchnic, sub-esophageal. Taking the genus Girasia to exemplify the nervous system in the Zonitidæ (fig. 1, C, D), these ganglia are all, as it were, coalesced together, and the side connectives are not seen. The several nerves leading from the upper or dorsal side of the mass define the cerebral

position, while those below show by the direction they take the pedal and visceral parts of the ganglionic mass. From the cerebral parts nerves lead to the eye and oral tentacles and to the sides of the mouth—one (large) to the side of the buccal mass and another (smaller) to where the salvary ducts are given off from From the pedal ganglia numerous nerves, some very minute, lead to the sides of the foot, distributed along its edge; one, conspicuous and long, extends to the edge of the mantle on Some of these nerves bifurcate before reaching the right side. the foot. These visceral nerves thus break up and extend all over the body of the animal along the course of the alimentary canal and the generative organs, &c Land-Mollusca possess sensory organs, and their sense of touch and smell acute, both combined directing them in their search for food and hiding-places. The seat of the olfactory organs is the apex of the tentacles, more particularly the dorsal pair, but the ciliated surfaces of the body round the mouth and respiratory aperture assist in the sense of smell.

Two auditory sacs (otocysts) are usually found situated on the anterior side of the cerebral ganglia. They are lined with cilia and contain minute calcareous particles, called otocoma, of varied forms in different genera and species.

ALIMENTARY SYSTEM

The alimentary canal is very long, extending back in a loop within the apical whorls of the shell and returning forward to the side of the respiratory orifice (fig 1, B) In different genera there is considerable difference and complexity in the way in which it is coiled. The fore portion, called the fore gut, includes the buccal The narrow esophagus or gullet leaves this on the dorsal side, passes through the nervous collar, and expands into the crop Spread upon this are the salivary glands (fig 2, sg, p 3), generally paired but sometimes coalesced together, fine ducts, one on either side, called the salivary ducts, connect them with the buccal cavity (b). The fore gut contracts and again enlarges into the mid gut or stomach (st), and here a duct connecting it with the anterior (al) and posterior lobes of the liver occurs, and at about midway in its length the coils of the intestine buried in the postemor lobes (pl) return again and continue in a long straight portion of the rectum to the anus (a), which in shell-bearing torms is near the upper and inner angle of the aperture or near the junction of the right and left dorsal lobes, in the more sluglike forms (Austenia and Girasia) it is on the side of the body Where the shell has become reduced, as in these two Indian genera of the Zonitide, the visceia never occupy the foot to its terminal end, as is seen in Limax and other Palearctic genera

THE BUCCAL MASS

This lies between the nervous ring and the mouth, is a large globose muscular sac, on its exterior sides having a wonderful system of powerful muscles leading to different parts of the animal, principally to the shell-muscle, by which the animal can move it in every direction, protrusive or otherwise. These muscles have been termed the anterior, lateral protractors, and pharyngeal or buccal retractors.

ODONTOPHORE AND JAW.

Just within the circle of the mouth is the buccal cavity, and on the upper anterior side is the solid chitinous jaw set in the strong mandibular muscles. In the genera treated of in this work there are only a few in which the law is absent; in those possessing it, it is sometimes solid, sometimes thin and of oxygnathous type, i. e with a sharp cutting-edge. The jaw serves to press down upon, hold, or even cut off what the animal may feed upon. Within the buccal cavity on the lower side is a cartilaginous globose cushion on the floor of the mouth, the odontophore, its upper surface is covered with a tough, long, ribbon-like membrane, set with rows of minute, recurred, chitinous teeth, extending backward to the radular sac. In this last the teeth are formed and pass gradually forward as the rows in front become worn away. These teeth help, with the edge of the law above and the action of the lingual protractors and retractors, to the rasping off and breaking up of food The surface of the radula can be folded together, as in the state of rest, or spread out laterally over a plane surface. The odontophore is developed early in life in some ovoviviparous forms; the radula is found complete in the embryo enclosed in the eggs lying in the oviduct.

The teeth of the radula are arranged in rows, generally about a hundred—the rows either nearly straight or forming with the central tooth at the apex an obtuse angle. The central tooth and its neighbouring admedians are usually set upon thin, broad, quadrate plates, which merge gradually into lateral teeth rising from much narrower plates. The cutting-tooth is sharp-pointed and raised well above the basal plate, the whole series forming a most perfect natural file.

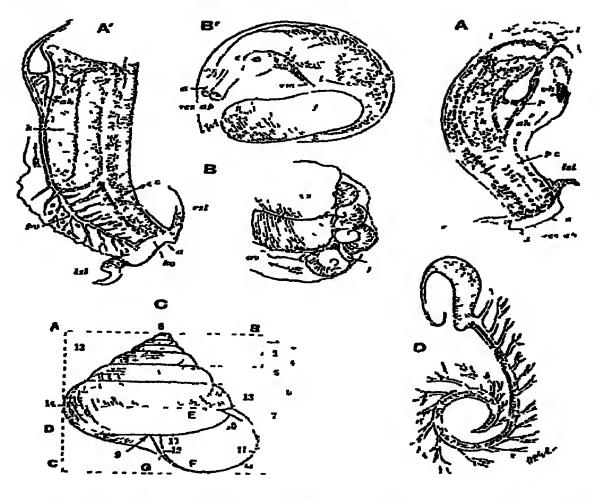
In carmyorous genera the teeth are aculeate or scimitar-shaped,

rising from elongately ovate bases.

Perhaps one of the most interesting morphological characters to be noticed in the radula of these Eastern slug-like mollusks, comprising even some with *Helicarion*-like shells, is the existence of two very distinct groups or subfamilies, one with a *Macrochlamys*-like radula, the other with a very different polydont one of several hundred teeth, all similar in form throughout on very narrow basal plates, and rarely having any large admedian, though a few intermediate forms occur.

ORGAN OF RESPIRATION.

The respiratory orifice is distinctly seen on the right side of the body, lying in a dextral shell near the upper inner angle of the aperture, in a slug-like mollusk it is on the right side, in both



Tig ii

- Dorsal side, viewed from above, to show A Sakiella honesta, enlarged position of the perion dium (p), beart with auricle (ak) and ventricle (ik),
- Lidney (\$\lambda\$), pulmonary cavity (pc), liver (\$\lambda\$), anus (\$\alpha\$), mantle-edge (\$m\$)

 A Dorsal side, seen from below Rectum (rec), Lidney-opening (\$\lambda\$), pulmonary yeni (pv), right shell-lobe (rsl), left shell-lobe (lsl)
- B Microcycles amber showing embryonic shells within the oviduct
- B' An embryonic shell, showing development of the foot, with eye and anal and respiratory orifices $\times 44$
- O Shell of Sitala attegra Diagram to illustrate the different parts and usun) measurements
- D A spermatophore of Seeara infrendens, much enlarged After Stoliczka

Parts of the thell and usual measurements

- 1-7 The apical whorl to the 7th (the last or body-wharl)
 - The antepenultumate whorl
 - The penultimate whorl
 - The apex
- 9 The umbilical region 9 The axis 8-14 Spire
- 10 The aperture the upper, outer, and inner angles of, the interval between being the wall of the aperture
- 11 The peristome and outer
- Lin The columeliar margin
- The suture
- 14 The periphers or keel
- A-B Minjor diameter A-C. Height of shell
- **√--}**)
- Do of axis
 Do of aperture
- G-II Breadth of aperture

near where the dorsal lobes meet. The pulmonary chamber or cavity lies beneath the shell on the left side just behind the upper margin of the peristome and continues back for some distance, its general shape and size presenting variation in different genera. The upper surface is an extremely transparent thin wall, showing, in most species, a system of small veins uniting in a main pulmonary vein (pv) and forming a respiratory surface by which they breathe air directly. On the posterior left side of the pulmonary chamber is the pericardium (fig. 11, A, p).

HEART AND CIRCULATORY SYSTEM.

The pericardium (fig. 11, A, p) is a sac lying on the left anterior side of the body in dextral shells, adjacent to the branchial cavity and close against the renal organ (L), all these lying on the dorsal surface of the body. Within it is the heart, composed of a single auricle (ah) and a single ventricle (vh) the first receives the blood from the respiratory organs, which passes by a short constricted valvular passage to the second. A short duct, the aortic trunk. follows - it branches into two separate veins, the anterior and posterior norta, conveying the generally colourless blood to the various organs of the body. Thence it collects in the venous sinuses in the foot and viscera and the circumference of the body before entering the respiratory (pv) and renal organs (k) the former of these oxidation takes place and the blood returns to the heart again by the pulmonary vein (pv). In the renal organ waste products in the blood are taken up, which are thrown out by way of a narrow passage (lo) lying parallel to the rectum and so on to the anus (a).

REPRODUCTIVE ORGANS.

The generative orifice is situated close behind the right eyetentacle(fig 1, A, p. xx). The animal is hermaphrodits or monocious. the male and female systems being brought together in one individual, and the animals unite for inutual fecundation. The source of the system lies far back in the visceral sac (fig. i, A), where burned in the posterior lobe of the liver is the ovo-testis (hg)(a mass of cells), on the internal surface of which both ova and spermatozoa are produced the former are rounded cells, the latter long and hair-like, with variously-shaped heads massed together. From the ovo-testis extends a long duct called the hermaphrodite duct (hd), usually very much convoluted, and down which the ova and spermatozoa pass. The duct enters the albumen-gland (alg), an elongate mass, and just before it does so there is a small enlargement or sharp bending termed the seminal vesicle The ova here undergo a certain change and are separated from the spermatozoa—the one to pass down the oviduct, the other down the prostate.

The oviduct (ov) is of a whitish colour, with large convoluted folds. These two coalesced ducts run side by side for a considerable distance and then separate, the overtestis becoming a

stout hollow tube, the free oviduct leading onwards to the genital aperture (gen ap), the prostate or sperm-duct becoming a slender tube, the vas deferens (vd) carrying the spermatic contents to the We have now reached the vicinity of the head and buccal mass Before the free oxiduct reaches the genital aperture it gives off a more or less globose or pear-shaped sac, varying much in size, this is the spermatheca (sp) It receives, when the animals are in coitu, the spermatophore, which issues from the male organ of the other individual. The male organ (p) consists of a muscular reversible sheath or tube extending a short distance from the genital aperture backwards, and gives off, generally where it doubles back, a strong muscle called the retractor penis muscle The next part contracts into a smaller length of tube, the epiphallus, to which the vas deferens joins after this latter has formed a loop forward and close up to the genital aperture. the junction of the vas deferens and the epiphallus is usually a cæcum-like appendage, the kalc-sac, or flagellum when more whip-Within this the spermatophore is tormed. Yet another organ, not universally piesent, iemains to complete this complicated system, viz the amatorial organ or dart-sac (am or) is usually tough and muscular, cylindrical in form, with a retractor muscle at the distal end, within it is a pointed style, which is protrusive at the genital orifice. This is analogous to the calcareous dart of the Helicide The male organ and adjacent parts is reversible and protruded externally during

The spermatophore (fig 11, D) is a complex structure built up or moulded within the walls of the flagellum during the period of generative activity. It consists of two distinct parts—one long and gutter-like, generally spined, the other a thin-walled cylindrical sac in which the spermatozon passing down the vas deferens collect and are retained until transplanted into the sperm-sac of another individual to fructify its ova. The spermatophore takes on many various forms in different genera and is as yet quite unknown in the great majority of the Land-Mollusca, it would appear to be secreted rapidly and its remains broken up

are soon absorbed and disappear.

The eggs when laid hatch out naturally by the warmth of the atmosphere, but in some genera an ovoviviparous habit has come about, and the eggs are retained in the oviduct (fig. n, p. xxvi, B, & fig. 2, p. 3) and go through the early stage of development there, so that the young have well-formed shells and are able to crawl

about and feed themselves as soon as they are born.

The shell makes its appearance is very early embryonic life, in the form of a little rounded inverted cup or bowl, and as the infolded viscera begin their spiral growth it is built up on the free outer edge (the peristome). It is deposited by the edge of the mantle in different layers, the external either horny or membranaceous, in many cases it is very hard, glassy, and polished. In overviewed above, where the shell attains a development of two whorls or so, the subsequent shell-growth after birth is well marked by its different texture, the first whorls are generally smoother and are distinguished as the protoconch.

It is seen that the organs of generation in these creatures are very complicated and present great variation, not only shown in different genera, but even in detail in different species of the same genus It is only to be expected that the more complicated an organ becomes, and the greater the number of its component parts, the play and possibility of variation in those parts increases in proportion. This diversity of structure is rendered still more difficult to observe, owing to the great changes that take place in the reproductive organs as the pairing-season approaches, also artificially by the means adopted to preserve the animal. It, for instance, it is put into too strong spirit, great shrinking and hardening ensues, and the parts assume a shape and size very unlike their appearance in life. All this must be allowed for in descriptions Perhaps too much has already been written on the form of such an organ as the spermatheca or sperm-sac, sometimes empty, at other times distended with one or more spermatophores.

The Mollusca form a very distinct and highly organized division of the Invertebrates. They were very early inhabitants of the globe; their remains are found in the oldest stratified rocks, their shells often most beautifully preserved. It is the knowledge of the animals of their living representatives which gives us an insight into the conditions under which the different formations were deposited. It is remarkable to note how highly organized they were so far back in time and how little has been the change since

then, scarcely more than generic

Marine forms are more abundantly represented, and naturally so, than the land and freshwater Probably the earliest freshwater form is the Archanodon, which closely resembles the modern Anodonta (Swan Mussel) and occurs as far back as the Devonian At the close of the same epoch the first land-snails, St. ophites and Dendropupa, allied to the Chrysalis Shells (Pupidæ), have been found in the Plant-beds at St John, New Brunswick. The Coal-Measures of the succeeding Carboniferous period have yielded further species of Dendropupa, a small land-shell (formerly referred to Zonites) closely allied to the living Pyramidula if not identical with that genus Also from the same beds come the oldest brackishwater snail and freshwater snail belonging to the existing genera Ampullaria and Physa respectively, as well as the first representative (Zaptychus) of the Auriculidae (the most primitive of the Pulmonates), and Dawsonella the earliest example of the terrestrial Helicindæ Other freshwater mussels (Unio) appeared in the Trias, but the greater number of freshwater snails are first known from the Julassic Planorles Valvata, Melania (doubtfully from

the older, but certainly from the later beds of that epoch), with

Limnæa, Vivipaia, and others.

In India the Cretaceous locks of the South Peninsular area are the oldest in which land-shells have been found, and one species was identified by Ferd Stoliczka as being closely related to the existing Ceylonese genus Corilla Further close search in these beds will probably result in the discovery of other species and they would be of extreme interest

The Intertrappean beds of Southern India contain several freshwater genera, and a doubtful Pupa is recorded from the Bombay rocks of that age, and land-shells have been obtained in the Lower Intertrappeans referred to Achatina, here, again, further search is wanted, minute forms have probably never been looked

for

Coming down to more recent times, the species of Mollusca which have been found in the Sewalik formation are similar to those now living only one land-shell, Pupa (Cylindrus) insularis, a species with a range from India to Africa, has hitherto been found, others are freshwater forms belonging to Paludina, Melania, Ampullaria, and Unio. My own experience of the beds in which these fossils occur points to the possibility of much more coming to light when they are worked in the careful manner similar beds have been in this country and in Europe

From the later Tertiaries of the Kashmir Valley (Karewah deposits) species of *Planorbis* and a *Helix* (?) occur, but those found by me were all flattened by subsequent pressure the beds had undergone this formation, which is extensive, would reward

further search.

It must be remembered by those who may use this work that the material on which many of the anutomical details here given have been drawn up has been very scanty, and frequently founded on but a single badly preserved specimen, such, for example, as the dried-up animal found within the shell and soaked out; for in most cases the possibility of obtaining additional specimens from

very maccessible parts of India was remote in the extreme

With regard to the conchological side, the descriptions of the genera and species have been drawn up and all measurements taken afresh by Dr. Blanford, in most cases from types or from typical specimens. The descriptions of the anatomy have been abridged and the figures taken from those given by Dr. Ferdinand Stoliczka in the 'Journal of the Asiatic Society of Bengal,' and those by me in the 'Land and Freshwater Mollusca of India,' and in other papers contributed to various Scientific Societies. The distribution, habits, &c have been taken from the writings of W. H. Benson, T. Hutton, F. Stoliczka, H. F. & W. T. Blanford, W. Theobald, G. Nevill, E. Sykes, O. Collett, &c, or based on the knowledge of a very large number of species collected by myself

Though the land-mollusca are not, like birds, butterflies, &c, conspicuous to the ordinary observer, yet they are to be found in

every part of India, even on so parched a rock as Aden. Hence a few words on where and how to collect them may be of service to a naturalist proceeding to the country These mollusks are by no means easy to find at first, and they are naturally much more numerous in the rainy season, but with patient search they are to be found at other times of the year On limestone rocks they are sometimes conspicuous by their abundance, old shells litter the ground. In the forest-clad slopes of the mountains, particularly the northern sunless ravines, they are generally plentiful. Owing to the annual burning that takes place, very few are to be found in the great grass-tracts of the plains Their favourite resorts are under large stones, old logs lying in the woods, under the decaying bark of trees, on the wet lichen-clad bark, on the damp moss near waterfalls, on walls, on the leaves of shrubs, the plantain and bamboos, under decaying leaves, beneath the surface of the ground in the worm-burrows, in the roots of plants, and in the exuvio left by floods on river-banks many shells are to be found washed off the land. It is a good plan when collecting from shrubs and trees to place an open, inverted umbiella beneath and to beat the shrubs or boughs above, when the specimens dislodged will be caught in the umbrella. In streams and lakes the surface of the water-plants and the decaying stems of reeds and bulrushes should be looked over.

The animal is by no means difficult to dissect, patience and a steady hand are all that is required, to dissect, draw, and mount the radula and other parts will take some hours of work, and a a microscope is indispensable. In the field the preserving, the accurate labelling (which is most important), with necessary notes on external characters, colour, &c., are as much as the collector can undertake

Some parts of India have been well worked, there are others where nothing has yet been collected. Among the latter I may mention Nepal up to the Kali River, Bhutan east of longitude 89° up to the Dafia Country, eastward again the Miri and Mishmi Hills, south of the Brahmaputra River, the Abor and Singpho Hills; south of Manipur, the Lushai and Tipperah Hills, and the high range, the Chin Hills, southwards. The Shan States have been partially collected in, but there is much to be done in many parts of Eastern Burma. On the North-west Frontier, with the exception of a species of Peticuis, I have never seen any land-shells from either Swat, Dir, or Chitral. From the Kuram Valley a few species have been received; but since Captain Hutton, in 1842, collected in the neighbourhood of the Bolan Pass, the land-shells of the Suliman Range and hills to the south, lying west of the Indus, have been disregarded

In conclusion, I must not forget to mention those who have given much valuable assistance to Dr. W. T. Blanford while the work was in preparation and those who have given similar aid to myself to all sincere thanks are due. Among them I would particularly mention Mr. Edgar A. Smith, I S O., in charge

of the Mollusca Department of the British Museum, who was ever ready to place species at our disposal and often added his valuable opinion on the determination or history of the species in hand. The late Professor Alfred Newton and Prof. S. F. Harmer gave every facility for the examination and loan of specimens contained in Benson's typical collection forming part of the McAndrew Collection in the University Museum of Zoology, Cambridge. Colonel R. H. Beddome placed his fine collection and his great knowledge of the Southern Indian land-shells at Dr. Blantord's disposal. I have myself to thank him for many valuable species preserved in spirit. Messrs John Ponsonby and G. K. Gude's collections have been available for study. I am indebted to Mr. B. B. Woodward for many suggestions relating to molluscan anatomy as well as to their geological ancestry.

Much valuable material, without which the work would have been more incomplete than it is, was received from India collected by Messrs Edgar Thurston in Madras, the late O Collett in Ceylon, as well as H B Preston; in Southern India and Siam by the late W M Daly; in Cachar by F. Ede The Superintendents of the Indian Aluseum, Calcutta, Col. A. W. Alcock in the first instance, and more recently Dr., Annandale, have given very valuable and in collecting and sending home many interesting species properly preserved as well as specimens for comparison. The late Wm Theobald placed the whole of his valuable collection

of spirit-specimens in my hands

I sincerely trust that the publication of these two Families, which is only a small portion of the Land-Molluscan Fauna of India, will lead naturalists resident in or visiting that country to collect and study this branch of its Natural History not to be content with collecting the shells alone, but to bear in mind whenever they find the living animal to preserve it and send it, should they not require it for their own examination, to the Indian Museum in Calcutta of to the British Museum at home, where sooner or later it will be available for the investigation of Malacologists

H. H. GODWIN-AUSTEN

Nore, July 1908

ERRATUM

[MOLLUSCA.

Class GASTEROPODA.

Older PULMONATA.

Suborder GEOPHILA or STYLOMATOPHORA.

Group AGNATHA.

Family TESTACELLIDÆ.

Subfamily STREPTAXINÆ.] *

Animal carnivorous, slug-like or snail-like; a shell generally present, but varying much in form. No jaw (hence the group is often distinguished as *Agnatha*). Radula with numerous rows of long, narrow teeth, usually pointed

Distribution. Temperate and tropical regions of the world.

The majority of the genera are African or South American. Two are Indian, both shell-bearing.

Synopsis of Genera.

Genus STREPTAXIS.

Streptaxis, Gray, Loudon's Mag N H. new ser i, 1837, p 485, Stol J. A S B xl, 1871, p 159 (anatomy)

Type, S. nobilis, Gray, from Sierra Leone.

Range. South-eastern Asia and a few of the islands; Mascarene Islands; Tropical Africa and South America. Found in the Indian Peninsula to the southward only, in Ceylon, [Andaman and Nicobar Islands,] Assam, and Burma, but not in the Himalayas except east of Bhutan



Fig. 1.—Streptants pfeiffer: } (After Stoliczka.)

Shell thin hyaline, or thicker alabastrine, heliciform, the last whorl or last two whorls excentric, diverging from the axis of the upper whorls.

^{*} In this volume the additions to the MS as left by Dr. W T Blanford have been made by Lt-Col H. H Godwin-Austen and are placed between brackets.

Animal, as in other members of the family, with the anterior portion of the body, or neck, much longer than the posterior portion, or tail, which is very short. The colour is bright yellow, often becoming scallet on the eye-pedicels and upper portion of the head. Upper tentacles or eye-pedicels elongate, lower tentacles short. Genital onlice on the right side, near the respiratory orifice and at a considerable distance from the tentacle.

[The description of the internal anatomy is taken from Ferd.

Stoliczka's paper on the genus -

In the main points (vide fig. 2) "the organs are quite similarly arranged as in the Helicida. . . . The mantle is above, at the pulmonary ouffice, considerably produced, receding ventrally, but remaining entire On the inner side it has near the margin an elongated, thickened appendage on each side of the pulmonary opening The pulmonary cavity itself is very long, but the lungs nairow The digestive system differs from all Helicida which T have examined by the peculiar development of the buccal parts The mouth is wide, and immediately behind it, where it makes an angle, lies the nervous ring. . . Immediately behind the nervous ring the buccal parts are produced into a cylindrical muscular tube, which extends in a slight curve up to the end of the chief retractor muscle of the body, where it is firmly attached by a special thick muscle. A few separated threads connect the mouth direct with the anterior end of the retractor The ringmuscles forming the outer layer of the tube are almost horny, or, at least, very tough The longitudinal muscles forming the internal layer are much softer, but considerably thicker"

This description recalls the buccal mass of Testacella and its powerful muscles. It suggests Streptaxis being carnivorous and having a protrusive mouth, enabling it to enter and use the radula within the whorls of other snails. Stoliczka pointed out the similarity of the teeth of the radula to those of Testacella. There are other points of similarity, such as the tube-like clusters of the hermaphrodite gland and the form of the male organ (vide Proceedings of the Malacological Society of London, vol. 1 plate 1

figs 14 & 16)]

Gental organs simple, albuminous gland elongate; hermaphrodite gland small, composed of a cluster of tubes, the duct long and much twisted Spermatheca small and globular, with a narrow neck [attached to uterus for nearly the whole length] Vas deferens very short Penis short, muscular, the retractor muscle long and thin and attached to the commencement of the penis close to the junction of the vas deferens; no flagellum or kalc-sac. Eggs large and well developed in the oviduct.

Radula long and narrow, composed of numerous rows of simple, almost straight and pointed teeth, [40-60 in row,] each furnished with a small swelling or projection about halfway between the point and the base. The median tooth in each row scarcely differs in form from the lateral teeth. The row is curved into an

arc on each side of the middle, with the concavity in front



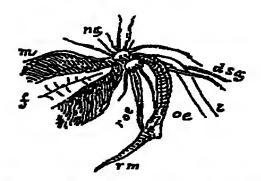
[Fig 2 -Anatomy of Streptaxis obtusus (After Stoliczka)

- a. Anus ah Auricle of heart. al Anterior lobe of liver Albumen-gland b Buccal mass See oe, fig 4 or Retractor of buccal mass c Cavity where hermaphrodite and albumen gland were ,originally situated eg, nq Cerebral ganglia or nervous ring Foot gen ap Generative aperture hd Hermaphrodite duct hg Hermaphrodite gland. Intestane Kidney or renal organ
- Lo Kidney-opening m Mantle mi Mantle-lobe
- Ovum **Esophagus**
- ov Oviduct Penus
- pl Posterior lobe of liver
- pv Pulmonary vein
- mp Retractor muscle of penis
 - sg Salivary gland dsg Duct of sp Spermatheca or receptaculum
 - seminalis Stomach
 - t Eye-tentacles
 - vd Vas deferens
 - vh Ventricle of heart





Fig 3 —Radula of Streptaxis obtusus (After Stoliczka)]



[Fig 4 -Buccal mass, ganglia, &c. of Streptaxis obtusa (After Stoliczka)]

The measurements of Streptaxis are the following —The length and breadth are the diameters of the shell as it rests on the body-whorl; the height is that of the shell laid on a flat surface at right

angles to the other two.

Forms of this genus are common on the hills of Southern India and several of the species occurring appear to be widely spread and very variable. The teeth in the peristome vary in number and position, and even the number of the parietal lamelle is not always constant, whilst important differences may be found at times in the shape of the shell

- I. Peristome edentulous or nearly so (occasionally a small tubercle inside right margin).
- A. Penultimate whorl rounded or bluntly angulate, not keeled, a single parietal lamella.
 - a. Depressedly ovate; penultimate whorl, seen from beneath, extends half its width beyond body-whorl
- Streptaxis petiti, Gould (Helix-Streptaxis), Bost Jour N H 19, 1844, p. 456, Pfr (Streptaxis) Mon Hel. 1, 1847, p 8, id. t c. vii, 1876, p 494, H & T C I. 1876, pl. 8, fig 4; Nev Hand-l. 1, 1878, p 3.

Shell umbilicated, translucent, whitish, finely, closely, and flexuously costulate above, smooth beneath; spire depressedly conoid; whorls 6½, convex, penultimate whorl subangulate, last whorl flatly convex beneath, compressed around the umbilicus; aperture a truncated oval; peristome white, expanded throughout, outer margin much curved forward.

Length 10, breadth 7, height 6½ mm

Hab. Tavoy and Mergui, Tenasserm; ? Moulmein.

Streptaxis bombax, Bs (Helix) A M. N. H (3) iii, 1859, p 186;
 Theob J. A. S B. xxviii, pt. 2, 1859, p 308, Pfr (Helix) Mon

Hel v, 1868, p 151, Stol (Streptaxis) J A S B xl, pt. 2, 1871, p 167, Theob J A S B xlv, pt 2, 1876, p. 186, pl 14, fig. 6; H. & T (Helix) C I 1876, p 15, pl 31, figs 1, 4 (immature shell); td (Streptaxis) t. c 1876, p 63, pl 156, fig 9, Nev. Hand-l 1, 1878, p 3.

Similar to S petiti, but larger and longer in proportion to the breadth, with the penultimate whorl much deeper and rounded at the periphery; last whorl subangulately compressed at the base behind the peristome, right margin of peristome but slightly arcuate.

Length 15, breadth 95, height 85 mm.; of a similar form 12, 8,

and 7.5 mm.

Hab. Moulmein. Some of the immature specimens originally called Helix bombax were from Phietan, Tenasserim

3. Streptaxis and manicus, Bs A M N II (3) vi, 1860, p 192;

Pfr Mon Hel v, 1868, p 444; H & T C I 1876, pl. 8, f 6;

Nev Hand-l 1, 1878, p 2, [Godwin-Austen, P Z S 1895, p 443]

Shell umbilicated, with arcuate costulate striation above, smooth beneath; whorls 5½, convex above, the penultimate rounded; breadth across body-whorl scarcely greater than across penultimate whorl when viewed from below, and last whorl rounded, not compressed, around the umbilicus; aperture a trancated oval, slightly compressed on the outer edge; peristome white, expanded, the outer border arcuate

Length 8, breadth 5½, height 4 mm.

Hab. Andaman Islands.

4 Streptaxis blanfordi, Theob J A S B ANNI, 1864, p 245, Nev Hand-l 1, 1878, p 2 (Arakan & Pegu)
Streptaxis blanfordianus, Stol J A S B xl, pt 2, 1871, p. 163, pl 7 [fig. 8 (Arakan), fig 9 (Pegu)], Pfi Mon. Hel vii, 1876, p 494
Streptaxis burmanica, H. & T (nec Blanford) C I 1876, pl 8, fig 5. [Streptaxis blanfordi, var., Godwin-Austen, P Z. S. 1895, p 443]

Very near S. andamanicus, but rather more narrowly umbilicated, slightly compressed around the umbilious, and usually with a distinct tubercle inside the outer border of the peristome, the outer margin of which is less arouate

Length 72, breadth 5, height scarcely 4 mm

This appears to be merely a variety of S andamanicus Hab. Arrakan, Pegu, Shan States, Cocos Islands

Streptaxis layardianus, Bs A M N H (2) x1, 1853, p. 90,
 Pfr Mon. Hel. 1v, 1859, p 332; id t c v1, 1876, p 495; H & T C. I 1876, pl 98, figs 1, 4, [Nev Hand-l. 1, 1878, p. 4]

Shell perforate, subumbilicated, striated, whitish; spire low, convex, whorls $6\frac{1}{2}$, convex above, penultimate rounded, the last

convex, slightly flattened beneath, very little compressed at the base; aperture subtriangularly semi-oval; peristome expanded, deeply sinuate at the angle, the sinus sometimes terminating in a small blunt tubercle on the parietal wall; a single parietal lamella

Length 94, breadth 7, height 5 mm

Hab The hills of Southern Ceylon. This passes into S. cingalensis, p 12

- Depressedly ovate, the penultimate whoil, seen from below, just extends beyond body-whoil
- 6. Streptaxis burmanicus, Blf, Theobald, J A S B xxxii, 1864, p 245, pt Blf J A S B xxxiv, 1865, pp 81, 105; Pfr Mon Hel v, 1868, p 444, id t c vii, 1876, p 494, Stol. J A S B. xl, pt 2, 1871, p 113, pl 7, figs 5-7

 Streptaxis blanfordi, H & T (neo Theobald) C I 1876, pl 8, fig 10, [Nev Hand-l 1, 1878, p 2 (Toungoop & Tounghu, small var Hangoon, vide Stol t c pl 7, figs 6, 7)]

 Streptaxis thebawi, Godwin-Austen, P Z S. 1888, p 243

Shell umbilicated, finely, closely, and flexuously costulate above, smooth beneath, whitish; spire convex; whorls 6-61, slightly convex above, the penultimate rounded at the periphery, last whorl much broader than the others, slightly flattened beneath,



Fig 5 -Streptaxes but manicus

very little compressed around the umbilicus. Aperture semi-oval, parietal lamella well developed; peristome white, expanded, outer border boldly arcuate, and with sometimes a small tubercle or tooth inside opposite the top of the parietal lamella. This tooth is often

Length 10, breadth 7½, height 6 mm; of a smaller specimen 7½.

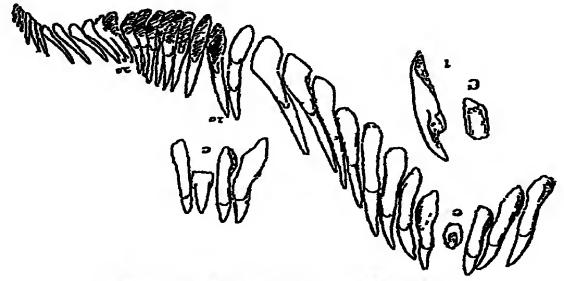
54, and 4; of S. thebawn 10, 7, and 6

Hab. Arrakan and Pegu, S thebawn from Pingoung, Shan Hills, Upper Burma.

7. Streptaxis pfeifferi, Zelebor, Venh zool-bot Ges Wien, xvii, 1867, p 806, Pfr Mon Hel v, 1868, p 444, id t e vii, 1876, p 495, Godwin-Austen, P Z S 1895, p 448
Streptaxis pfeifferianus, Stol J A S B al, pt 2, 1871, pl. 8, fig 6 (animal), Nev Hand-l 1, 1878, p 2 Var minor, Morch, Jour de Conch Oct 1876, p 859 Kar Nicobar. Var pumilio, Morch, t c. Oct 1876, p 359 Kamorta.

Similar to S. burmanicus, but with half a whorl less; the

sculpture above is finer; the base around the umbilicus is rounded, not compressed, the parietal lamella less developed, the mouth more rounded, the peristome on the outer side much less convex, and neither compressed nor tubercular



[Fig 6 -Streptaxis pfeiffer: × 158 & 296]

[The radula has the formula 29.1.29. The centre tooth is smaller than the first and second; in one specimen examined, the centre tooth was quite rudimentary.]

Length 83, breadth 6, height 41 mm.

Hab. Nicobar Islands, Camorta, Katchall, Kar Nicobai.

- c. Ovately conord; penultimate whorl completely hidden from beneath by body-whorl, when seen in the direction of the axis of the upper whorls
- 8. Streptaxis solidulus, Stol J A S B xl, pt 2, 1871, p 166, pl 7, fig 10, Pfr. Mon Hel vn, 1876, p 494; H & T. C. I. 1876, pl 98, fig 7, Nev Hand-l 1, 1878, p 3

Shell moderately umbilicated, whitish, solid, finely and flexuously costulate above, smooth beneath; spire conical; whorls 6½, the upper flatly convex, penultimate rounded at periphery, bodywhorl by far the largest and deepest, slightly compressed around the umbilicus; aperture semioval, parietal lamella moderate; peristome expanded throughout, nearly in one plane, outer margin scarcely arouate

Length 12, breadth 9, height 7½ mm.

Hab. Near Moulmein, at Yethebiankoo on the Attaran River. Typical locality (Theobald).

- B. Penultimate whorl sharply keeled, shell much depressed.
 - a Base of last whorl smooth and polished.
- 9 Streptaxis exacutus, Gould, Proc Bost Soc N H vi, 1856, p 13, Pfr Mon Hel iv, 1859, p 331, id t c vii, 1876, p 494, H & T C I. 1876, pl 98, figs 8, 9, 10, Nev Hand-l i, 1878, p 3

Shell openly umbilicated, whitish, finely and flexuously costulate above, less closely on the last whorl, which is smooth beneath, except behind the peristome, spire very low, whorls 6½, flat above, the penultimate with a compressed keel which projects considerably beyond the last whorl, the latter convex around the umbilicus, breadth of body-whorl, seen from beneath, less than that of penultimate, aperture truncately oval, two parietal lamellæ, one in the middle of the parietal wall, the other smaller, close to the outer angle; peristome white, expanded, very slightly arcuate above on the outer border.

Length 12½, breadth 7½, height 6 mm Hab Moulmein (Stoliczka), Mergui (Mus Cum.).

- b. Shell finely costulate throughout, above and below.
- Streptaxis sankeyi, Bs A M N. H (3) in, 1859, p 472, Pfr Mon Hel v, 1868, p 442, id t c vii, 1876, p 494
 Streptaxis sankeyanus, Stol J A S B xl, pt. 2, 1871, p 167, pl. 7, fig. 14, Nev Hand-l i, 1878, p 3

Shell very like that of S. exacutus, but the keel on the penultimate, though sharp, is not compressed, whilst the body-whorl is angulately compressed around the umbilicus. Only a single parietal lamella; columellar border of peristome quite straight.





Fig 7 —Streptaxis sankeyi

Length 11½, breadth $7\frac{1}{4}$, height $5\frac{1}{2}$ mm.; a smaller specimen measures 10, $6\frac{1}{2}$, and $5\frac{1}{4}$ mm.

Hab Farm Caves, near Moulmenn (Stoliczka), Mergui (Mus. Cum.)

Streptaxis hanleyanus, Stol J A S B xl, pt 2, 1871, p 168 pl 7, fig 15, Pfr Mon Hel vii, 1876, p 494
 Streptaxis sankeyi, H & T (neo Benson) C I 1876, pl 8, fig 7; Nev Hand-l 1, 1878, p 3

Very near S. sankey, but narrower, with the penultimate whorl scarcely broader than the last whorl, and with the mouth almost rectangular and oblong, the outer margin being compressed and straight as well as the columellar Generally, too, the present species is smaller and more depressed.

Length 7½, breadth 4¾, height 4 mm.; a larger specimen measures 10, 7, and 5 mm., the latter is the form figured as

S. sankeyi in the 'Conchologia Indica.'

Hab Kwengon Hill, near Moulmein (Theobald).

- II. Both parietal margin and inside of peristome tooth-bearing.
 - A. Penultimate whoil rounded.
 - a Globosely ovate, finely costulate above, narrowly umbilicated
- 12 Streptaxis obtusus, Stol J A S B 1, pt 2, 1871, p 166, pl 7, iigs 11-13, pl 8, figs 1-4 (anatomy), Pfr Mon Hel vii, 1876, p 495, Gude, Proc Mal Soc v, 1903, p 323, pl 12, figs 8-10, Nev Hand-l 1, 1878, p 3

Spire low, convex, whorls 7, flattened above, penultimate whorl bluntly subangulate below the middle and scarcely projecting beyond the last whorl, which is compressed around the umbilicus, and on which the sculpture becomes gradually fainter below, aperture slightly compressed on both sides, rounded externally, one parietal lamella with an additional tubercle near the angle; peristome with a small tubercular tooth inside the columellar margin, and another, still smaller and sometimes wanting, inside the outer margin, which is but slightly arounte

Length 10, breadth 7, height 61 mm

Hab Chouktalon, a limestone hill south of Moulmein (Theobald)

- b Depressedly ovate, striated or smooth.
- a'. Lup of peristome not continued across parietal margin of aperture; 1 or 2 parietal lamellæ
 - b' Upper surface smooth, more or less streated.
- 13. Streptaxis theobaldi, Bens A M N H (3) in, 1859, p. 187

 Pfr Mon Hel. v, 1868, p 449, H & T C I 1876, pl 8, fig 9

 G-A J A S B xlv, pt 2, 1876, p 317, pl. 8, fig 15, Nev.

 Hand-l 1, 1878, p 3

Shell arcuately rimate, smooth, whitish, translucent; spire low, convex; whorls 5-5½, convex above, penultimate whorl rounded, not projecting or scarcely projecting beyond the body-whorl when viewed from beneath; last whorl broader, swollen beneath, compressed around the umbilicus, rising on the penultimate whorl towards the mouth, with three indentations behind the peristome; aperture subtriangularly semi-ovate, with 7 teeth inside; peristome expanded, deeply cut back at the upper angle, with a lamellar fold

just inside the sinus and a larger elongate lamella in the middle of the parietal callus, of the other teeth three are inside the outer lip, the third lying in the curve, and two are columellar

Length 6, breadth 4, height 3 mm.

Hab. Khasi and Naga Hills, south of Assam; Daffa Hills, west of Bhutan, at low elevations (G.-A.), N.E Manipur (Ogle); and Bhamo, Upper Burma (Anderson). A very globose broad shell, 5½ mm. long, 4½ broad, from the Naga Hills, in Col. Beddome's collection, may belong to a distinct form.

14. Streptaxis dafiaensis, G-A J A S B xlv, pt 2, 1870, p 317, pl 8, fig 14

This species is near S. theobalds, but is slightly larger, with a lower spire, the umbilicus is broader and deeper, and there is only one lamella in the middle of the parietal callus, not a second close to the angle of the aperture

Length 7, breadth 5, height 31 mm.

Hab. Near Tanır Peak, Dafin Hills, east of Bhutan, 4000 feet.

15. Streptaxis peroteti, Petit (Helix), Rev Zool 1841, p 100, Pfi Mon Hel 1, 1847, p 9, 1d t c (perrotteti) 111, 1853, p 288, 1d t c (perroteti) 111, p 496, H & T C I 1876, pl. 98, 113 193 194 195, J A S B xlix, pt 2, 1880, p 205, New Hand-l 1, 1878, p 4 Streptaxis latior, Gude, Proc Mal Soc v, 1903, p 323, pl 12, 195 1-4

Shell rimate, rather thun, smooth and striated above, polished beneath, yellowish white, spire convex; whorls 5½, flatly convex above, penultimate rounded, projecting beyond the last whorl when viewed from below, last whorl flattened at the base, slightly broader than penultimate, indented behind the peristome; aperture semi-oval, slightly sinuate at angle; peristome white, expanded, parietal lamellæ normally two, close together, converging behind, that to the left median and longest, the other sometimes wanting,





Fig 8 -Streptaxes perotete

teeth inside peristome three, one on right border, one basal, the third columellar (occasionally a small fourth tooth is found in the outer margin near the angle)

Length 10, breadth 6, height 4½ mm; a smaller specimen 8, 6,

and 4½ mm.

Hab. Plateau of Nilgiris, also Anaimalais and hills near Tinnevelly A large variety has been found by Colonel Beddome in Ceylon, measuring 94, 64, 43 mm.

11

A variable shell; some specimens, apparently fully adult, have only one parietal lamella, and the extent to which the penultimate whorl, when viewed from below, extends beyond the body-whorl varies considerably To this is due the difference in the proportion of length to breadth, shown by the measurements.

Streptaxis footei, W & H Blf J A & B xxx, 1861, p 858, pl. 2, fig 6; Pfr Mon Hel v, 1868, p 448

Near S. perotet, but with only one tooth inside the peristome, situated about the middle of the outer margin; two parietal lamellæ; 5 whorls, the penultimate projecting very slightly when viewed from below, subumbilicated like S. watson:

Length 62, breadth 5, depth 4 mm.

Hab Sholamalar Plateau; Pachamalais, near Salem, 3000 ft A variety from Kalrayan Malar, another hill-group near Salem, collected by Colonel Beddome, has an additional basal tooth inside the peristome and the parietal lamella near the angle small or wanting.

17. Streptaxis watsoni, W & H Blanf J A S. B. xxix, 1860, p 126, nidem, t c xxx, p 359, pl 2, ng 7, Pfr Mon Hel. v, 1868, p 447, H & T C I 1876, pl. 8, fig 8, Nev. Hand-l i, 1878, p 4

Similar to S. peroteti, but considerably smaller; whorls 5, umbilicus larger and deeper, peristome more deeply sinuate at the angle, parietal lamellæ always 2, stronger and further apart, and teeth in the peristome more developed, from 3 to 5 in number.

Length 6, breadth 41, depth 3 mm. Hab. Nilgiris, Wynaid, Anaimalais.

18. Streptaxis beddomii, Bif. (Nev MS) P Z S 1899, p 765, pl 50, figs 4-7
Streptaxis pleurostomoides, Gude, Proc Mal Soc v, 1908, p. 324, pl. 12, figs 14-16

Distinguished from S watson: by having a single parietal plait, and the teeth inside the peristome differently arranged. There are three small equal and equidistant teeth, one halfway down the columellar margin, a second farther down, and a third in the base, a fourth tooth inside the right margin. Although there is only one parietal plait, there is sometimes a tubercular swelling on the parietal wall at the termination of the sinus of the peristome.

Length 6, breadth 41, height 3 mm.

Hab. Anaimalais (Beddome).

A larger variety with an additional upper tooth in the right margin, and with the three equal columellar and basal teeth rather nearer together, measuring 7, 5, and 3½, has been brought by Col. Beddome from near Kuttálam, Tinnevelly, 4000 feet above the sea This appears to be S plemostomoides of Gude A shell

from the Wynard measuring 8, 6, and 4 mm. may be a still larger form

19 Streptaxis concinnus, Bif J. A S B xhx, pt. 2, 1880, p 203, pl 2, fig 11

Subumbilicated, smooth, striated, whitish; spire convex, very low; whorls 5½, convex; penultimate rounded, completely hidden by the broader last whorl when the shell is looked at from beneath in the line of the axis of the upper whorls, last whorl tumid and polished below, compressed around the umbilicus auteriorly, constricted by indentations behind the peristome, aperture with outer and columellar margins nearly straight and converging outwards, rounded at the base; peristome white, expanded, but little curved back at the angle, parietal lamellæ 2, both elongate, the inner long, and bent inside, teeth in peristome 5, two columellar, one small near the umbilicus, the other double, one transverse and lamellar at the base and two inside the outer margin

Length 6½, breadth 4, height 3 mm. Hab. Balaraugam Hills, Mysore.

This is very near S. watsons, but distinguished by the penultimate whorl not projecting below.

20 Streptaxis scalptus, Blf P Z S 1899, p 766, pl 50, figs 8, 9, 10

Shell subumbilicated, moderately depressed, ovate; costulately striated above, smooth beneath, waxy, whitish, spire depressedly conoid; whorls 5½-6, convex, penultimate rounded, projecting less than half its breadth beyond the last whorl when viewed from beneath; last whorl moderately convex, compressed laterally near the aperture, constricted by indentations behind the peristome; aperture semioval, contracted by one or (more often) two parietal lamells and by 3, 4, or 5 subequal palatal teeth, most commonly 4, one columellar, one distal and two in the right margin.

Length 10, breadth 7, height 5% mm

Hab Kolamalaı Hills, Salem district (Beddome), Balur in Kadur

district, Mysoie (Daly)

A. specimen from Toina Hill, near Poona, Deccan, measuring

11½×8½×6 mm., may perhaps be referred to this form.

21. Streptaxis cingalensis, Bs A M N H (2) xii, 1853, p 91;

Pf. Mon Hel iv, 1859, p 383, vii, p 496, H & T C I 1876,
pl 98, figs 2, 3, Nev Hand-l 1, 1878, p 4

Similar to S layar dranus (p. 5), but slightly larger, with the last whorl less excentric and rather more convex beneath; the deep sinus in the peristome at the angle always ends in a tubercle on the parietal wall, and there are two small tubercular teeth inside the peristome, one in the middle of the outer margin, opposite the ridge of the parietal plait, the other at the base of the columellar margin.

Length of type 11, breadth $8\frac{1}{3}$, height $5\frac{3}{3}$ mm (Benson), a typical specimen lent to me by Mr. Layard measures 10, $7\frac{1}{3}$, and 5 mm.

This is, I think, merely a variety of S. layardianus. I have seen intermediate forms with rudimentary palatal teeth.

Hab. Hewagam Korale, S.W. Ceylon.

A small shell measuring $53 \times 4 \times 3$ from Ohiya, Ceylon, 6000', is in Mr. Sykes's collection. It is a miniature of S. cingalensis.

22. Streptaxis gracilis, Collett, Proc Mal Soc 111, 1898, p 1.

Shell subperforate, depressed, smooth, whitish; spire low; whorls 4½-5, convex above; the penultimate rounded behind, scarcely projecting beyond the last whorl when seen from below; last whorl convex beneath, slightly compressed around the umbilicus: aperture semioval; peristame slightly expanded, white, cut back into a rather deep sinus at the angle; a single parietal lamella, and one palatal tooth at the base of the columellar margin.

[The radula is very long; the teeth are similar to those of S. pfeiffers, only the centre tooth is rather longer in proportion to the first and second; the formula is 25.1.25. The buccal

mass is as described by Stoliczka]

Length 4½, breadth 3½, depth 2¼ mm

Hab. Near Lemastota, Uva Province, Ceylon.

23. Streptaxis lævis, Blf P Z S 1899, p. 765, pl 50, figs. 11, 12

Similar to S. burmanicus (p. 6), but smooth and finely striated, not costulate above, and with a minute basal tooth inside the peristome in all (3) specimens examined, in one specimen there are two teeth.

Hab. Burma (Beddome).

24. Streptaxis ravanæ, Bif. P Z S 1899, p. 768, pl 50, figs 13, 14, 15

Shell rimate, minutely perforate, striated; spire low, convex, whorls 7, flattened above, penultimate rounded, only just projecting beyond the body-whorl when seen from below; last whorl flattened beneath, compressed anteriorly around the umbilicus; aperture semioval, with one parietal plait and 4 (or 5) palatal teeth, two on the right margin, one distal and one near the base of the columellar border, with a second rudimentary tooth higher up; peristome expanded, cut back into a moderate sinus at the angle.

Length 13½, breadth 10, height 7 mm.

Hab. Ceylon. I have long had a specimen, but do not know the exact locality.

- n" Peristome continued by a thick lip, bearing a single re-entering Y-shaped lamella, across parietal margin
- 25. Streptaxis personatus, Blf. J A S B Alix, pt 2, 1880, p 202, pl 2, fig 10

Shell umbilicated, smooth, pale yellowish white; spire depressed, whorls 5, slightly convex above, the penultimate rounded, scarcely projecting beyond the last, which is slightly compressed around the umbilicus, constricted and pitted behind the mouth; aperture semioval, peristome thickened and expanded, continuous across the last whorl, with a deep sinus at the angle and furnished inside with a thick parietal lamella, two teeth inside the outer, and three in the columellar margin, the lower and larger of the teeth inside the outer border opposite to top of the parietal lamina.

Length 5, breadth 4, height 2½ min.

A larger variety, 6½ mm long, has only three or four teeth inside

the peristome, not counting the parietal lamella

Hab Hills near Cumbum, Madura, South India; Peermede, Travancore, Shevroys (Beddome)

26. Streptaxis pronus, Blf J A S B xlix, pt 2, 1880, p 204, pl 2, fig 12

Near S personatus, but costulately structed above, and with the last whorl very excentric, the penultimate, when seen from below, projecting by more than half its breadth; whorls 5½, penultimate rounded, last whorl somewhat flattened beneath, sharply compressed around the umbilicus, subcostulate within, aperture elongate, truncately oval, peristome white, expanded, with 4 teeth, 1 columellar, 1 basal, and 2 in outer margin, besides the parietal lamella, which is curved within and subbifid in front; the sinus at the angle of the peristome well marked, but much less deep than in S personatus.

Length 61, breadth 4, depth 3 mm.

Hab Hills near Tinnevelly, S. India (Beddome)

B. Penultimate whorl carinate.

*27. Streptaxis elisa, Gould, Proc Bost Soc N H. vi, 1856, p. 13, Pf. Mon Hel v, 1868, p 448

Shell of moderate size, much distorted and compressed, finely stricted above, smooth beneath and broadly perforated; spire discoid; whorls 7½, angulate near the deep suture, the last very much extended laterally; aperture transverse, subquadrate; perstome everted, armed inside with 4 teeth cruciformly disposed, a small fifth posterior tooth being sometimes added

Length half an anch (12½ mm.), height one quarter inch (6 mm)

(Gould, Lat)

Hab. An Island in the Mergui Archipelago (Rev J. Benjamin).

28 Streptaxis canaricus, Bif (Beddome MS) J. A S B xxxvii, pt 2, 1869, p 142, pl 16, fig 11, Pfi Mon Hel vii, 1876, p 497, H & T C I 1876, pl 156, figs 7, 8, Nev Hand-l i, 1878, p 3

Shell umbilicated, depressed, finely costulate above and below; spire very low, coincal, whorls 5½, nearly flat above; penultimate





Fig 9 -Streptaxis canaricus

sharply keeled, projecting by more than half its width beyond the body-whorl, when seen from below; last whorl flatly convex beneath, compressed around the umbilicus; constricted by indentations behind the peristome, aperture semioval, rather bload, peristome continuous, expanded, curved back con-

siderably at the angle, a thick, flexuous, deeply re-entering parietal lamella, and 6 palatal teeth.

Length 7½, breadth 6, height 3½ mm.

Hab South Canara (Beddome).

29 Streptaxis subacutus, Blf P Z S 1899, p 767, pl 50, figs 1, 2, 3

Shell rimate, perforate, depressedly ovate, solid, with flexuous costulate striction above, smooth beneath; spire depressedly conoid; whorls 6½, flattish, penultimate obtusely keeled, projecting by fully half its breadth beneath beyond the last whorl, which is slightly convex below, compressed and subangulate near the aperture, rugosely stricted inside the umbilicus; indented outside behind the peristome; aperture semioval, with 1 or 2 parietal lainellæ, the outer small or wanting, and 3 palatal teeth, peristome expanded, moderately curved back at the angle.

Length 11½, breadth 8, height 6 mm.

Hab. South Canara (Beddome)

30. Streptaxis compressus, Bif J A S B, alix, pt. 2, 1880, p. 201, pl 2, fig 13

Shell openly subumbilicated, very depressed, striate, translucent, dull yellowish, spire almost flat, whorls 4½, flattened above, but with the suture impressed, the penultimate whorl bluntly carnate, projecting by nearly its whole breadth when seen from beneath, last whorl flattened below except near the peristome, where it is compressed into a ridge, indented behind the aperture, which is nearly semioval, but with the margins converging distally; peristome expanded, slightly sinuate at angle, parietal lamella bifid or double, palatal teeth 4 or 5, two columellar teeth being close together and generally united.

Length 62, breadth 33, height 3 mm.

Hab Sivagiri Hills, Tinnevelly, and hills near Cumbum in same district. The variety from the latter locality is filiformly striated above and within the umbilicus, and the parietal lamella is double.

Genus ENNEA.

Ennea, H. & A Adams, Gen Rec Moll. 11, 1858, p 171, Stol. J A S B xl, pt 2, 1871, p 169 (anatomy of E. (Huttonella) bicolor).

Type, E. bicolor, Hutt.

Range Throughout Southern and South-eastern Asia from Arabia to Japan and the Philippines; also Madagascar, with the Mascarene Islands, and throughout tropical and Southern Africa

Shell pupiform, ovate, cylindrically ovate or turreted, hyaline in structure. All Indian species have plaits or teeth in the aperture, and all, except one Nicobar form, are imperforate and arcuately rimate.

Animal like that of Streptams No jaw. Radula similar; that of Ennea bicolor is long, containing between 80 and 90 rows of teeth, with 19 teeth (9.1.9) in each row. The median tooth is short, sharply pointed, with an enlarged knob on each side towards the base; the laterals are longer, slightly curved, each with a blunt knob on the outer side, their size decreases outwardly (Stoliczka) According to Morelet, Ennea is viviparous, producing one young at a time.

I. Imperforate, rimate.

- A. Aperture subaxial, not truncated above, oval, with an accessory, nearly circular, portion on the right almost cut off by a parietal lamella and a palatal fold or swelling; peristome white, expanded, continuous, indented at parietal lamella, deeply sinuate around subtubular accessory portion of aperture.
 - a. Peristome united to penultimate whorl and partly covering it.
- 31. Ennea vara, Bs (Pupa) A M. N. H (3) 111, 1859, p. 188; Pfr Mon Hel. v, 1868, p. 455, G.-A P Z S 1872, pl. 30, fig 6, Pfr t c v11, 1876, p. 501, H & T C I 1876, pl. 100, fig 3, Nev Hand-l i 1878, p. 7.

Spire elongately ovate, subfusiform, white, strongly ribbed





Fig 10 -Ennea vara f. and aperture ?

vertically, spire turreted, regularly diminishing, apex obtuse; whorls 8, slightly convex, the last much compressed laterally,

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bluntly subangulate beneath, ascending in front; aperture vertical, with a slight columellar callosity, but no plant, the accessory tubular portion almost halfway down the right margin, peristome broadly expanded.

Length 52, breadth 2, length of aperture and peristome nearly

2 mm

Hab. Khásı Hills, Jaintia and N. Cachar Hills (G.-A).

32. Ennea stenopylis, Bs A M N H (3) v, 1860, p 460, Pfr Mon Hel v, 1868, p 455, G-A P Z S 1872, pl 30, fig 5, Pfr t. c vii, 1876, p 501, Nev Hand-l i, 1878, p 7.

Shell ovate, somewhat flexuously and obliquely costulate, whitish horny; apex obtuse, whorls 6½, narrow, slightly convex, antepenultimate broadest, last whorl much compressed laterally, indented externally behind the peristome, aperture vertical, no columellar plant.

Length 3½, breadth 2½, height ap 1½ mm, in another specimen length 3¾, breadth 2 mm. Benson's type was 3½ and 1½, showing

much variation.

Hab. Sikhım, about 4000', Dafla Hılls, Khásı Hılls, Naga Hılls, Manıpur (G.-A.)

33. Ennea nagaensis, Blf (Godwn-Austen MS) P Z S 1899, p 769, pl 50, fig 22

Near E stenopyles, but larger and more elongate, with 7 whorls; and with the broadly expanded peristome of E. vara Costulation fine, close, oblique, and flexuous

Length 44, breadth 2, height of aperture 13 mm.

Hab Naga Hills

34 Ennea blanfordiana, G-A P Z S 1872, p 515, pl 30, fig 4, Pfr Mon. Hel vu, 1876, p 501; H S T C I 1876, pl 100, fig 2

Shell cylindrically ovate, obliquely costulate on upper whoils, almost smooth and polished on the lower, whitish horny, translucent, spire with nearly straight lines, becoming curved near apex, which is obtuse, whorls $8\frac{1}{2}$, the last two or three sometimes slightly narrower across the shell than fifth and sixth, the last compressed laterally, indented on outer side behind peristome, aperture vertical, with the subtubular accessory portion higher up the right margin than in E stenopylis and E vai a, a small tubercle inside dextral margin on the palatal fold, and a deep-seated columellar fold.

Length 7, breadth $2\frac{1}{2}$, length of aperture with peristome

11-2 mm.

Hab North Cachar, Mahadeo Peak near Asalu, 5700' A smaller variety, measuring 54 mm in length, was found at Hemeo Peak in the same district

35 Ennea fartoidea, Theob (Pupa) J A & B and x, pt 2, 1870, p 400, If (Pupa) Mon Hel viii, 1877, p 372

Pupa (Ennea) fartoides, H & T C I 1876, pl 100, fig 5, Nev (Ennea-Huttonella) Hand-l 1, 1878, p 7

Shell scarcely rimate, subcylindrically ovate, obliquely costulate, the sculpture becoming fainter or obsolete on the lower whorls, spire as in E blanfordiana; whorls 7-8, fourth or fifth broadest, the last very little compressed, slightly ascending, aperture slightly inclined, not vertical, no columellar or basal teeth; the subtubular appendage higher than in the last three species, quite at the angle of the aperture

Length 4, breadth 1½, height of aperture 1 mm Hab Shan States, Burma (F Fedden)

mo Shan Staves, Burnin (P. Pettaen)

36 Ennea milium, Godium-Austen, J. A. S. B. xlv, pt. 2, 1876, p. 317, pl. 8, fig. 11 (teeth in mouth require correction), Blf. I. Z. S. 1899, pl. 50, figs. 18, 19.

Like E faitoidea, but much smaller and with only six whorls, the upper three obliquely costulate, the lower three smooth, ambercoloured, aperture with a curved parietal plait, three tubercular palatal teeth and an internal columellar lamella, of the palatal teeth two are in the right margin, the upper being opposite the parietal lamella, and the third in the base is low and broad Peristome white, expanded

Length 21, breadth 1 mm

Hab Shengorh Peak, 7000', Daffa Hills, north of Assam (G.-A.)
Only a single specimen known

- b Peristome free from penultimate whorl (DIAPHORA.)
- 37 Ennea cylindielloidea, Stol (Ennea-Huttonella) J A S B. vl., pt 2, 1871, p 171, pl 7, fig 4, Pf. (Ennea) Mon Hel vn, 1876, p 507, H S T (Pupa-Ennea) C I 1876, pl 160, fig 10

Shell turreted, finely and closely vertically costulate, except on the uppermost whorls, spire slightly but regularly diminishing, apex obtuse, sutures deep; whorls S, convex, swollen below the suture, the last two slightly unirow, the last bluntly keeled at the base, free near the aperture, slightly descending, aperture slightly inclined, rounded, the parietal lamella thick and oblique, peristome expanded all round

Length 41, breadth 13, length of aperture 09 mm. (Stohazka)

Hab Damotha, near Moulmein

A specimen in the British Museum from Damotha, presented by Dr Hungerford, approaches the above species in many respects, but it is smooth, with the sides of the spire slightly concave above It is 4 mm long. This is probably an undescribed form, but it looks slightly distorted, so I shall not propose a name for it.

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38 Ennea seatoni, Beddome, P Z S 1891, p. 315, pl 29, figs. 15-19

Similar to *E. cylindielloidea*, but considerably larger, with 101-11 whorls, finely, not very closely costulated. The aperture is very differently shaped, being oval, considerably higher than broad, with the subtubular portion in the right upper corner almost cut off by a vertical parietal lamella and a thickened subangular plait inside the outer margin, both of these plaits are twisted inside, so as to appear from the aperture like additional teeth, there is also an internal obliquely descending columellar fold and another external lamella just visible from the front; peristome expanded throughout, deeply sinuate at the angle; last whorl free for a short distance behind the peristome, compressed and bluntly subangulate at the base.

Length 9, breadth 21, height of aperture nearly 2 mm.

Hab. Limestone rocks east of Mooleyit, near Siam frontier, Tenasserim

39. Ennea brevicollis, Bif P Z S 1899, p 768, pl 50, figs 16, 17

Intermediate in size and form between E. cylindrelloidea and E. seatons, distinguished from the former by larger size, coarser



Fig 11.—Ennea brewcolles

and more distant filiform costulation, and from the latter by its differently shaped mouth, which is nearly as broad as high. Whorls 11, all, except the upper three, filiformly costulate, the last solute for a short distance and closely costulate where free. No columellar lamellæ.

Length 8, breadth 2, height of aperture 13 mm. Hab. Moulmein (Theobald)

- B Aperture semioval or oblong; generally truncated above.
 - a Shell turreted. (HUTTONELLA).
- 40. Ennea bicolor, Hutton (Pupa), J A S B in, 1834, pp 86 & 93, Pfr (Pupa) Mon Hel in, 1848; p 352, Bs. (Pupa) A M N H (2) iv, 1849, p 125, Pfr Mon Hel iv; 1859, p 342, Semper, Ress d Phil in, 1890-94, pl 8, fig. 14: Stol (Ennea-Huttonella) J A

8 B vl, pt 2, 1871, p 169, Pfr. Mon Hel vn, 1876, p 505, H & T (Pupn) C I 1876, pl 100, fig 6, Nev (Ennea-Huttonella) Hand-1 1878, p 6

Pupa mellita, Gould, Proc. Bost Soc N II n, 1846, p 98
Pupa (Ennea) coylamca, Pf. P Z S 1855, p 9, id Mon Hel 1v,
1869, p 342, II & T C I 1876, pl 100, hg 4

Shell subcylindrically turreted, smooth, polished, translucent, yellowish white; spine slightly attenuate above, apex very obtuse, suture impressed, crenulate, whorls 7 (6-81), slightly convex, the last deeply indented externally and basally behind the peristome, aperture nearly vertical, truncated, somioval, containing four teeth, one parietal fold, close to the angle, continuous with the peristome and running into the columellar side, the second the largest,



Fig 12 -Ennea bicolor 4, and aporture f

triangular, on dextral margin of the peristome, opposite the first *, peristome subtubular, the third small and basal, the fourth columellar, a curved fold commencing inside and running obliquely inwards, peristome white, expanded, curved back into a sinus at the angle

Length 7, breadth 2, height of aperture 11 mm. Other speci-

mens are smaller, I have adults only 4 mm long.

Hab Almost throughout India, Ceylon, Burma, and Nicobar Islands, chiefly in open of cultivated plains, not, as a rule, in forest. This shell occurs throughout the greater part of the Indian region, also in the Seychelles and Mascarene Islands, and in several islands of the West Indies, where it has probably been introduced by man

The spire varies considerably, some shells being much more

attenuate above than others

[The animal, taken from Stoliczka's description, has a long body, laterally strongly compressed, posteriorly shortened, though on the whole a little more produced than in Streptaxis, more or less distinctly yellowish, on the head reddish, pedicles long, slightly thickened at the end, their external skin is yellow, but the internal eye-bearing peduncles are vermilion, eyes very small, tentacles small, pale reddish, mantle deep red. The internal anatomy

^{* [}Stoliczka says, and he examined the animal, "Two of the teeth are placed at each side of the posterior (or upper) angle of the mouth, producing a sort of canal, in which terminates the pulmonary orifice and the anus."]

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exactly corresponds with that of Streptans. The radula is very long, the sides curved up like a sheath of a bamboo-leaf. The centre tooth is short, sharply pointed, with a rapidly widened base. The adjoining and following teeth are longer and slightly curved, decreasing in size outward, and arranged 9 1 9 It is carnivorous. In January 1897 Mr Collett took specimens off the sea-wall at Galle, Ceylon, preying upon Opeas gracilis, which it resembles somewhat. The long anterior body, combined with the protrusive odontophore, of E bicolor enables the creature to enter and reach the furthest internal whorls of O gracilis and other shells.]

41. Ennea macrodon, Blf J A S B xlix, 1880, p 205, pl 2, fig 15

Shell turreted, pale, horny, with fine, close, vertical hair-like costulation; spire diminishing very slightly above, apex obtuse, whorls 7, convex, the last ascending slightly near the aperture, not indented; aperture vertical, semioval, obliquely truncated above, almost filled up with teeth, consisting of a prominent high re-entering subbifid parietal plait, a small tubercular tooth in the right margin, a large lamelliform obliquely transverse basal tooth



Fig. 13 —Ennea macrodon.

inside the lip, and a blunt columellar tooth; another deep lamella running into the shell is seen behind the basal one; peristome white, expanded, sinuate at angle, margins united by a distinct callus.

Length 5, breadth 2, height of aperture 11 mm.

Hab Pykára, Nilgiri Hills.

Young shells in this and the next five species have the dentition of the aperture fully developed.

42. Ennea subcostulata, Blf J A. S. B xlix, 1880, p 206, pl 2, fig 14 (upper fig)

Very near *E. macrodon*, chiefly distinguished by the filiform costulation being almost or quite obsolete. The teeth in the aperture are similar but less massive, and in the only adult specimen examined the broad lamellar basal tooth is replaced by two tubercular teeth

Length 51, breadth 2, height of aperture 14 mm.

Hab. Shevroy Hills, S India.

43 Ennea turricula, Bif P Z S. 1899, p. 768, pl 50, figs. 16, 17

Distinguished from E. macrodon by having slightly coarser and less close filiform costulation, only six whorls, and by the plaits inside the mouth being much less developed. In adult shells only the parietal plait remains conspicuous, but there are deepseated basal and columellar lamellæ in younger specimens with the peristome thickened and expanded a small basal tubercle also occurs. The transverse basal lamella of E macrodon is wanting, and the parietal plait is simple.

Length 5, breadth 12 mm.

Hab. Anaimalai Hills, 4000'; also S. Canara (Beddome).

44. Ennea exilis, Bif J A. S B xlix, 1880, p 207, pl. 2, fig 14 (lower fig, all the teeth are wrongly represented).

Similar to *E. macrodon*, but much more slender and entirely smooth, thin, and translucent Whorls 63-7 The teeth are smaller, the parietal lamella bears two knobs, but is not bifid; the basal plait is represented by two tubercular teeth united at the base and running obliquely into the shell, the only internal plait is columellar rather than basal, and not directly behind the basal tooth; the columellar and dextral teeth are simply tubercular

Length 41, breadth 11, length of aperture 1 mm. Hab. Balarangam Hills, Mysore.

45. Ennea pirriei, Pf. (Pupa) P Z S 1854, p. 255, id (Ennea) Mon Hel iv, 1859, p 341, id t o vii, 1876, p 505, H & T (Pupa-Ennea) C I 1876, pl 100, fig 1; Nev (Ennea-Huttonella) Hand-l 1, 1878, p 7

Shell turreted, very slightly diminishing above, whitish horny, upper whorls smooth, last two with very fine hair-like costulation; apex obtuse, whorls 7, slightly convex, the last compressed at the base; aperture roundly semioval, peristome white, expanded, margins joined by a thick callus, which is deeply indented above at the place where it bears a parietal lamella running into the whorl, there is also a columellar plant running obliquely inwards and commencing inside the mouth, no teeth in the basal or dextral margins

Length 10, breadth 21, height of aperture 2 mm

Hab Koondah Hills (Western portion of Nilgiris) (Purie)

46 Ennea sculpta, Blf J A S B xxxvIII, 1869, p 141, pl 16, fig 10, Pfr Mon Hel VII, 1876, p 504, H & T (Pupa-Ennea) C I 1876, pl 160, fig 1, Nev (Ennea-Huttonella) Hand-l 1, 1878, p 7

This differs from *E purie* chiefly in being coarsely ornamented with vertical slightly flexuous ribbing throughout except on the first two whorls. The callus that unites the margins of the peristone is not indented above the parietal lainella which is near

ennea. 23

the angle. Bight margin of peristome slightly arcuate. A deep columellar plant and four palatal lamellæ inside the aperture, not easily seen from it

Length 8½, breadth 2½, height of aperture 2 mm Hab Pulney Hills, S. India (Fan bank)

47. Ennea beddomii, Blf J. A S B alix, 1880, p 210, Blf P Z S 1899, p 770, pl 50, figs 20, 21

Shell turreted, pale yellowish white, vertically ribbed; spire tapering slightly but regularly above, apex obtuse, whorls 6, convex, the last rounded beneath; aperture rounded, truncated above, with one strongly developed parietal lamella entering deeply and a little twisted within, and a smaller deep-seated columellar fold, two or three small internal palatal teeth, and a blunt tubercular swelling inside the right margin opposite the parietal fold; peristome white, broadly expanded, continuous, curved back at the angle.

Length 33, breadth 13, height of aperture 3 mm.

Hab. Sivagiri Hills, near Tinnevelly.

48. Ennea canarica. Blf (Beddome MS) J A S B xlix, 1880, p 210, 2d P Z S 1899, p 770, pl 50, fig 25

Shell turreted, vertically ribbed, white, spire regularly diminishing upwards, apex blunt; whorls 6, convex, swollen beneath the suture, the last not ascending, rounded beneath; aperture rounded below, cut off in a straight line above, with a large parietal lamella and a small palatal swelling, opposite to each other, almost cutting off the area near the angle, a large internal columellar plant, also a minute parietal and a small basal tooth, both inside the mouth; peristome continuous, thickened, broadly expanded, slightly curved back near the angle

Length almost 4, breadth 2 mm.

Hab. South Canara

b Shell ovate

49 Ennea planguncula, Bs (Pupa) A M N H (3) vii, 1863, p 426, Pfr (Pupa) Mon Hel vi, 1868, p 329, H & T (Pupa) C I 1876, pl 101, fig 2, id t c pl 160, fig 3 (var), Nev (Ennea-Huttonella) Hand-l 1, 1878, p 7
Ennea stenastoma, Blf. (Beddome MS) J A S B xlix, 1880, p 208, pl 2, fig 17

Shell deeply rimate, cylindrically ovate, whitish, minutely obliquely costulate; spire cylindrical, with the sides straight, but becoming convex towards the obtuse apex; suture crenulate; whorls 6½, slightly convex, the last compressed laterally and deeply indented on both sides behind the peristome; aperture vertical, subaxial, oblong, higher than broad, both right and left margins concave, basal margin convex, the mouth greatly contracted by the following large teeth.—(1) a thick parietal fold

near the angle and (2) a large tubercular subbifid tooth on the right margin, both lunning into the whorl; also two columellar tubercular teeth, the larger just inside the lip, the smaller internal, and two small basal teeth right and left, peristome white, expanded, sharply curved back at the angle



Fig 14—Ennca planguncula 1, aperture 32.

Length 31, breadth 11, length of aperture 11 mm

Hab Peninsula of India, Orissa (Theobald), Golconda Hills, near Vizagapatam and Rusellcoonda (Beddome), Nerbudda Valley,

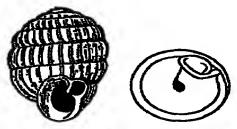
near Hashungabad.

A smaller variety, with 52 whoils, 3 mm long, was obtained by Col. Beddome from hills near Kurnool This is the form figured in the Conchol Ind pl. 160, fig 3 I have seen a specimen of what is probably a variety from Ceylon The fine oblique costulation and sutural crenulation often disappear.

II. Umbilicated.

*50. Ennea-moerchiana, Nev (Rospitorf MS) J. A S B 1, 1881, p 130; Godwn-Austen, P Z S 1805, pp 443, 450

Shell deeply but narrowly umbilicated, cylindrically ovate, subvertically rather distantly ribbed, white, solid, apex obtusely coiloidal, whorls 6½, convex, fourth and fifth broadest, last rounded at base, ascending in front, partly covering umbilicus, aperture



ig 15 -Ennea moerchiana t, and view of base

vertical, subaxial, rounded, parietal fold vertical, well developed, another strong but less prominent fold within right margin, no other teeth, peristome broadly reflected, deeply sinuate above the dextral fold

Length 13, breadth 23 mm Hab. Centre of Great Nicobar

Family ZONITIDÆ.

Subfamily ARIOPHANTIN.E.

[The Arrophantina form a very distinct subfamily of the Indian Mollusca, and are almost exclusively confined to the Peninsular area and Ceylon, only two species are found extending a short distance northward into the Gangetic delta, but have not been recorded from that of the Brahmaputra River. The largest Indian

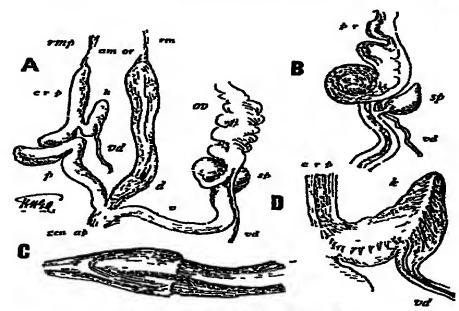


Fig 16 -Arrophanta lævipes

A Genitalia ×3

B Ditto, part of, showing spermatheca

O Portion of male organ near junction of vas deferens, showing position of a spermatophore

D Terminal end of the amatorial organ or dart

am or Amatorial organ or dart
crp Cacum musculs retractors
pens of Semper

d Dart

gen ap Generative aperture

k Kalc sac

p Penis

rm Retractor muscle

rmp Retractor muscle of penis

sp Spermatheca

v Vagina

ed. Vas deferens

land-shells belong to this subfamily. All are large and fine forms, both sinistral and dextral, they vary much in form from solid, turbinate, to thin and very globose shells, and to others *Helicarion*-like, thin, diaphanous, and membranaceous

The generative organs have three marked characters, viz, the penis excum ("excum musculi retractoris penis" of Semper), to which the retractor muscle is attached; a very small pear-

shaped or sessile spermatheca or sperm-sac, and conformably with it a very short spermatophore of peculiar form with close-set spines, different altogether from that of the Maciochlamina

Fig of animal, Pl I figs. 1 & 2]

[Synopsis of Genera.

1 ARIOPHANTA

With sinistral shells, solid or horny and thin , left dorsal lobe distinctly separate in two parts. Most species with aculeate laterals in the radula

2 NILGIRIA, CRYPTOZONA, XESTINA

Dextral shells, mostly solid, and many of large size; left dorsal lobe undivided, or merely slit

3 Inderella

Shell Helicarion-like, large and thin, a slit in the left dorsal lobe, radula with aculente laterals

4 RAVANA

Shell thin, depressed, smooth, of the Macrochlamys type, left dorsal lobe divided, foot truncate

5 RATNADVIPIA

Shell *Helicarion*-like, few whoils, thin, animal with both right and left shell-lobes, foot truncate at extremity, radula very broad, teeth very numerous

C EUPLECTA

Shell in most cases carrinte and closely wound , lobe above mucous pore more pointed; doisal lobe in two distinct parts, in the male organ a muscular band confines a portion in a looped arrangement.]

Genus ARIOPHANTA.

Ariophanta, Desmoulms, Bull Soc Bordeaux, m, 1829, p 235, pl 1, figs. 1-5, G-A Moll Ind 1, 1883, p 133, td t c 11, 1898, p 82, Bif. Proc Mal Soc 11, 1901, p 241

Cryptozona, Morch, Jour de Conch xx, 1872, p 334

Xestina, Pfeiffer, JB mal Ges v, 1878, p 257, vd Abh Ver Hamb vii, 1883, p 13, conf v Mart Zool Rec xv, 1880, p 102 Nilgiria, G-A Mol Ind i, 1888, p 253, vd t c ii, 1898, p 77, &

1899, p 123

Type, A. lavipes (Mull)

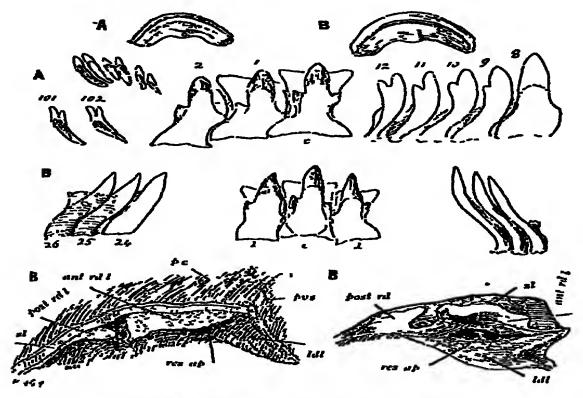
Range. The Indian Peninsula and Ceylon

Shell sinistrorse or dextrorse, perforate or umbilicated, of moderate or large size, depressed or globose, striated or decussately striated above, smoother beneath; peristome thin in general, but

not always, the columellar margin more or less reflected

Animal with the hody when extended rather broad and depressed (broader than that of Macrochlamys). A large mucous pore above the flattened posterior extremity of the foot, without any horn-shaped lobe above (a small blunt lobe is sometimes present); peripodial groove well developed, always double; sole broad, not distinctly divided beneath; upper surface of body with oblique strim, those on the head and neck anastomosing and forming a distinct tract. The mantle-edge is a narrow band reflected over the peristome. No shell-lobes; the two dorsal lobes are well developed, the left (right in sinistral forms) divided into two [a large anterior and a much smaller posterior; in the dextral forms, type solata, the left dorsal lobe is continuous, or a mere slit divides it into two as in basileus].

In the genitalia there is a kalc-sac, often of large size, which receives the vas deferens, a simple diverticulum or cæcum, varying



[Fig 17—A Ariophania læwipes Jaw and teeth of the radula, × 300

B Ariophania immerita Jaw and teeth of radula, × 155, and mantlecdge, viewed from the outside and from below, showing the
dorsal lobes, × 3

ant rdl Anterior right dorsal lobe post rdl Posterior right dorsal lobe. Idl Left dorsal lobe res ap Respiratory aperture

pro Parietal side of visceral sac Sliell-lobe pc Pulmonary cavity]

in length, leads from the junction of the kalc-sac and penis-sheath to the retractor muscle, the amatorial organ or dart-sac is long and more or less cylindrical, the spermatheca (receptaculum seminis) is small, globose, and either sessile or with a short stalk

Radula broad, with numerous teeth in each row rhachidian (central) tooth tricuspid, the side cusps small and basal; the inner laterals broad, bi- or tricuspid, forming a band of varying width down the middle of the radula, distinct from the area occupied by the outer laterals, which are elongate and uni- or bicuspid and

28

pass into aculeate pointed marginals. Jaw curved, with a small median projection

ZONITIDÆ

The egg of A lavipes is elliptical, longitudinally sulcated, enclosed in a tough membrane, and 4 to 5 mm. in length, 4 to 44

in diameter. That of A interrupta is similar.

This genus is now regarded as confined to the Indian Peninsula and Ceylon, various Burmese and Malay sinistral forms, formerly referred to it, being assigned to other genera; whilst a considerable number of dextral Southern Indian and Ceylonese species, formerly classed under Xesta and Hemiplecta, or separated as Cryptozona, Xestina, or Nilgiria, are now united with the typical sinistral forms of Ariophanta into a single genus, the animals being very similar in their general anatomy.

[Key to Species of Ariophanta

Section I Typical, sinistral. (ARIOPHANTA)]

A Shell perforate or very narrowly umbilicated

a Shell solid, not horny

a' Radula with a narrow central band of only 17 median teeth, the left dorsal lobe divided into two distinct parts.

lævipes laidlayana kadapaensis

b Horny, brownish, more or less translucent
b' Depressed

a". Radula with broad central band of 35 to 55 teeth

b" Globose

interrupta immerita bajadera intumescens

Subsp dalyn thyreus

Subsp heteræa

Section II Dextral (CRYPTOZONA P)

A Colour uniform or nearly so, no spiral bands of colour

a Decussated above

B Shell openly and deeply umbilicated

a' Radula with broad band of median teeth, left dorsal lobe undivided

& The whorls transversely structed, not decussated.

semrugata. belangeri albata sisparica novella ceraria

B Shell spirally banded with colour more or less distinctly

a. Decussated but not grooved

lıgulata İnstrialis basilessa gardeneri

- b Sculpture of decussating lines and of oblique shallow grooves and low ridges

basılcus beddomız

chenur qu'rana mader aspatana gassu soldu.

I Sinistrorse (ARIOPHANTA)

A. Perforate or very narrowly umbilicated

- a. Not horny banded spirally above, or white or brown throughout
 - [a'. Radula with a very narrow band of median teeth The left dorsal lobe divided]
- 51. Ariophanta lævipes, Mull (Helix) Hist Ver 11, p 22 (1774), Pfi (Helix) Mon Hel 1, 1847, p 71, id t c 111, 1853, p 75, id l. c vii, 1876, p 128, Nev (Nanina-Ariophanta) Hand-l 1, 1878, p 19, Godwin-Austen, J. A. S. B. alix, 1880, p 154, pl 10, fig 3 (animal), id Mol Ind i, 1898, p 133, pl 33, fig 7, pl 34, fig 1 (animal); 11, p 81, pl 80, fig 5 (anatomy), pl 82, fig 4 (radula), p 135

Helix trifasciata, Chemn, Mart & Chemn. Syst Conch-Cab x1, p 308, pl 213, figs 3018-10 (1795), Pfr Mon Hel 111, 1853, p 76, id t c. v11, 1876, p 128, H & T C I 1876, pl 131, fig 4

Shell depressed, rather thin, obliquely striated and decussated with fine spiral lines above, smooth beneath, white or whitish with three spiral chestnut bands, spire low, conoidal; whorls 5,

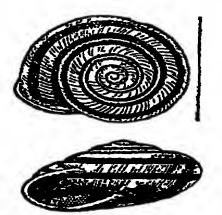


Fig 18 -Arrophania lavipes

slightly convex, the last rounded beneath, angulate at the periphery, the angulation generally disappearing near the mouth, aperture lunate, diagonal, peristome in one plane, simple above, slightly thickened and reflected below

Major diam 28, min. 23½, axis 15 mm. A large flat variety from Rajpipla measures 28½, 24½, and 13½

Hab. Bombay (common in gardens), Rappipla Hills, east of Surat. I have never been able to trace the occurrence of this

species in Malabar.

The commonest variety is white with three spiral bands—one near the suture, one above and one beneath the periphery, but some shells have the ground-colour brownish with darker bands, and some are white or dark brown throughout. The parietal wall of the aperture and the area around the umbilicus (periomphalus) are never darker than the adjacent portion of the last whorl

The teeth on the radula have the formula 120.2 8.1.8.2.120 (130.1.130): the rhachidian tooth is tricuspid; the eight inner laterals bicuspid and broad, forming a narrower median line than in other species of the genus, i e 17 teeth to 45 in the latter. The admedian teeth are bicuspid up to the 104th.

52 Ariophanta laidlayana, Bs. (Helix) A. M. N. H. (2) xviii, 1856, p. 253, Pfi (Helix) Mon. Hel. iv, 1859, p. 31, id. t. c. vii, 1876, p. 96, H. & T. (Helix) C. I. 1876, pl. 58, fig. 3. Nev. (Nanina-Ariophanta) Hand-l. i, 1878, p. 18, Godwin-Austen (Helix-Ariophanta), J. A. S. B. xlix, 1880, p. 155, pl. 10, fig. 2 (animal), id. Mol. Ind. 1, 1898, p. 140, pl. 34, fig. 3.

Similar to A. lævipes, except that the coloured spiral band close to the suture is wanting, and that the periomphalus or area around the perforation in the base and the parietal or inner wall of the aperture are always chestnut, contrasting with the rest of the wall. As a rule, too, the present species is less depressed and smoother. The coloration varies; specimens without bands are sometimes found, white or brown throughout

Major diam 28, min 23, axis 15 mm.

Hab The hill-country of Western and Southern Bengal, Orissa, &c., from the Ganges to south of the Godavari and west to about 80° E

53. Ariophanta kadapaensis.

Helix nicobarica, Chemn, Mart & Chemn Syst Conch-Cab 1x, 1, p 79, pl 108, figs. 911, 912 (1795), Pf. Mon Hel 1, 1847, p 40, ed t c vii, 1876, p 75, Bif J A 8 B xxxvii, 1889, p 189; H & T C I 1876, pl 52, fig 1

Nanna (Arrophanta) kadapaensis, Nev Hand-l 1, 1878, p 19, God-win-Austen, Mol Ind. 1, 1898, p 141.

Shell globose, obliquely strinted, generally with fine impressed decussating spiral lines, dull chestnut above, with a white spiral band near the suture and another round the periphery, the inner borders of the white bands darker, a broad white area round the base, periomphalus and parietal wall of aperture dark, spire convexly conoid, apex blunt, whorls 5½, slightly convex, the last rounded at the periphery, swollen below; aperture diagonal, soundly lunate, peristome small, reflected at the perforation

Major diam. 40, min. 35, axis 28 mm.

Hab. Cuddapah, Madras Presidency (King); Nullamullays,
Kurnool (Beddome), not Nicobars.

b. Horny, brownish, more or less translucent.

b'. Depressed.

54. Ariophanta interrupta, Bs (Helix) P Z S. 1834, p 90, id (Helix) Zool Jour v, p 401 (1885), Pfi (Helix) Mon Hel 1, 1847, p 63, id t c vii, 1876, p 125, H & T (Helix) C I 1876, pl 27, ing 3, Godwin-Austen, J A S B. Alix, 1880, p 154, pl 10, ing 1 (animal), id Mol Ind 1, 1898, p 130, pl 34, ing. 2, Bif Proc Mal Soc iv, 1901, p. 244

Helix himalayana, Lea, Obs 1, 1831, p 167, pl. 19, fig 66; Bs A M. N. H. (3) 1, 1863, p 88

Shell flatly convex above, rather coarsely, obliquely, plicately striated and decussated with fine impressed lines, the decussation sometimes obsolete, more turned and smoother beneath; brownish horny, darker below the periphery, and gradually becoming paler again beneath; whorls $4\frac{1}{2}$, convex above, the fast angulate at the periphery; aperture roundly lunate, peristome thin.

Major diam 26, min. 22½, axis 16 mm. (Calcutta). A large depressed variety from Pareshnáth measures 32, 27, and 17.

Animal pinkish grey.

Hab. Bengal, Behar, Orissa, Ganjam, Golconda Hills; Vizagapatam. Common in Calcutta [and extends to Jessore].

55 Ariophanta immerita, Bl (Nanina-Ariophanta) J A. S B xxxix, 1870, p 17, id t c xlix, 1880, p 155, pl 3, fig 4; Pfr. (Helix) Mon Hel vii, 1876, p 128, H & T (Helix) C I 1876, pl 150, fig 7, Godwin-Austen, Mol. Ind i, 1898, p 135, pl. 33, fig 1 (1883), pl 82, fig 6 (radula)

The Western race A immerita is smoother, with the spiral impressed lines nearly or quite obsolete. It has hitherto only been found in South Canara According to Godwin-Austen, Moll. Ind i, p. 135, the outer lateral teeth of the radula are more numerous in A interrupta than in A. immerita, but this is scarcely a character that is necessarily of specific value. The number in A. interrupta is 40.23.1 23.40 (63.1.63), so that the median row of large teeth is very broad. In A. immerita it is 25.24.1.24.25 (49.1.49). The rhachidian tooth has a cusp on each side, the admedian teeth only one on the outer side, the smaller lateral teeth are pointed, without lateral cusps. [See fig. 17 B (p. 27) also for the jaw and dorsal lobes.]

b". Globose

56. Ariophanta bajadera, Pfr (Helix) Zeitschr. Mal. 1850, p 69:

Bens (Helix) A M N H (2) x, 1852, p 350, Pfr (Helix) Mon

Hel ii, 1853, p 52, id t c iv, 1859, p 250; id t. c vii, 1876,
p 370, H & T (Helix) C I 1876, pl 3, fig 5, Godwin-Austen,

Mol Ind 1, 1898, p 137, 2d t c 11, 1876, pl 82, fig. 8 (testh of indula)

Helix ammones, Val, Desk in Fc: Hist Nat 1, 1850, p 197, pl 37 A, fig 1, Pf: Mon Hel 111, 1853, p 41, id t c viii, 1877, p 560

Shell thin, translucent, pale greenish to brownish horny throughout, rather glossy, coarsely plicately striated above, almost smooth beneath, spire conoidal, apex obtuse, suture rather deep, whorls



Fig 19 - Arrophanta bajadera

4-4½, convex, the last swollen, rounded at the periphery (immature shells are subangulate), descending slightly at the mouth, aperture diagonal, almost round, lunate, peristome thin, white.

Major diam 27½, min 22, axis 18½ mm

Hab. The Bombay Presidency, south of the Naibudda, ranging east to Nagpur. Common on the Western Ghats near Bombay. Not found in Bengal [Lives on leaves of one or two shrubs—W. T. B]

57. Ariophanta intumescens, Blf (Nanina-Ariophanta) J A & B xxxx, 1866, p 32, Pfr (Helix) Mon Hel v, 1868, p 321, id t c vii, 1876, p 370, H & T (Helix) C. I 1876, pl 111, fig 6, Godwin-Austen (Ariophanta), J A & B. xlix, 1880, p 155, id Mol Ind 1, 1898, p 138

A large duller shell than A. bajade a, thin, brown, with finer, less plicate striction, suture scarcely impressed, whorls 4½, almost flat above, the last bluntly angulate at the periphery, descending a little at the mouth, aperture large, rounded

Major diam 32, min 26, axis 23 mm Hab Mahableshwar (W T. B).

Teeth of radula 50.27 1.27 50 (77.1.77) The teeth are like those of A. interrupta, but the admedian series are tricuspid, there being a small tooth on the inner side as well as on the outer, lateral teeth very long and narrow, gradually becoming very small on the outer margin

58 Ariophanta canarica, Blf Proc Mal Soc 1v, 1901, p 248, pl 25, fig 1
Ariophanta intumescens, Godin-Austen, J A S B xlix 1880, pl x, fig. 4 (animal)

Shell openly perforate, globosely turbinate, brownish horny, rather solid, closely and rugosely striated, the striæ decussated

above by fine subobsolete impressed lines, spire conoid, apex subacute; suture slightly impressed; whorls 5, almost flat above, rapidly increasing, the last keeled at the periphery, descending beneath the keel towards the mouth, swollen beneath, somewhat compressed around the perforation; aperture diagonal, rounded, peristome in one plane, slightly thickened and a little expanded in adults, columellar margin broadly reflexed

Major diam. 30, min. 241, axis 21 mm.

Hab S. Canara (Beddome).

This should perhaps be considered a race of A intumescens, from which it is distinguished by smaller size, greater thickness, especially at the peristome, stronger decussated striation, higher and more acute apex, the presence of a keel, and a more open umbilicus. A small specimen measures 26, 21½, and 17½ mm. in the three dimensions

B. Openly and deeply umbilicated.

59. Ariophanta cysis, Bs (Helix) A M N. H (2) ix, 1852, p. 404;

Pfr (Helix) Mon Hel. iii, 1853, p 92, id t c iv, 1859, p. 174,

id t. c vii, 1876, p. 277; H & T (Helix) C I 1876, p 13, pl 25,

fig 5; Godwin-Austen, Mol Ind 1, 1883, p 139, id t c. ii,

1898, pl 82, fig 7 (teeth of radula)

Helix auris, Pfr P Z & 1854, p 286; id Mon Hel iv, 1859, p 173

Helix cystis, Rv Conch Ic., Helix, pl 123, no 737 (1852)

Helix ampullarioides, Rv t c pl 202, no 1423 (1854)

Ariophanta dalyi (subsp), Blf Proc Mal Soc iii, 1899, p 280,

figs; Godwin-Austen, Mol Ind ii, p 128, pl 98, fig 4 (1899)

(genitalia)

Shell globosely depressed, rather thin, obliquely striated, light yellowish brown; spire convex, apex obtuse, suture slightly impressed; whorls 4½, rapidly increasing, convex, the last swollen beneath, subangulate at the periphery, not descending near the mouth; aperture diagonal, ovally lunate, the margins converging; peristome thin, columellar margin reflected.

Major diam 43, min 35, axis 23 mm

Hab. The typical form is from the western side of the Nilgiris (Sispara) A ampullarioides is a higher and more globose form also from the Nilgiris, said to measure 42 mm. in major diameter by 26 in height. A dalyi is a small, thin, dark shell from Hadur in Mysore, in some respects approaching A intumescens. It has a whitish band round the periphery and measures 39, 32, and 22 mm. A. cysis has also been obtained by Beddome from the Anaimalais

Teeth of radula of cysis 60.22.1 22.60. The admedians are bicuspid, having a cusp on the outer side; only the rhachidian tooth is tricuspid, the laterals are aculeate [In the genitalia the male organ is much simpler than in A. lavipes, although of the same type. The retractor muscle is given off from a stout long excum, con-

tinuous with the main sheath below. At the junction of these two parts is the kulc-sac on a very short tube which the vas deferens joins. It is thus strikingly similar to the same part in the genus Ratnadvipia]

60 Ariophanta thyreus, Bs (Helix) A M N H (2) in 1852, p 405, Pfr (Helix) Mon Hel in, 1853, p 251, id. t c vii, 1876, p. 454, H. § T (Helix) C I 1876, pl 27, fig 6, Blf Proc Mal Soc iv, 1901, p 244.

Helix rysolemma, Albers, Zeitschr Mal 1852, p. 186, Pfr (Helix) Mon Hel in, 1853, p 634, id Nov. Conch i, 1854, p 37,

pl 10, figs 13, 14.

Ariophanta heterwa (subsp), Blf Proc Mal Soc. iv, 1901, p. 248, pl. 25, fig 2.

Shell depressed, rather more widely umbilicated than A. cysis, and distinguished from that species by having 5-5} whorls increasing more slowly, so that the mouth is comparatively much smaller, and by the distinctly decussated sculpture above

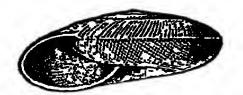


Fig 20.—Arrophanta thurcus

suture is scarcely impressed, except towards the mouth, spire low, convex. Colour brown horny, with generally a narrow dark rufous band below the subangulate periphery The peristome is blunt and frequently thickened.

Major diam 33, min 28, axis 16 mm A large specimen measures 40, 34, and 21 mm. Animal brownish grey, mantle paler.

Hab Brahmageri (Coorg); Nilgiri, Anaimalai and Balarangam Hills, S India

Intermediate forms between this shell and A. cysis occur.

A heleiaa is one of these intermediate forms. It is less depressed and thuner than typical thyreus, and more narrowly umbilicated, the sutures are deeper and the sculpture not decussated The colour is paler brown, and the narrow reddish band below the periphery is very distinct

Major diam 37, min 30, axis 21 mm Hab Sispara, west side of Nilghiris

A 1 4880lemma (1 hysolemma) 18 a large variety with coarse sculpture, measuring 40, 33, and 19 mm. Specimens collected at Sispara Ghat. Nilgiri Hills, agree with the description

II Dextrorse. (CRYPTOZONA, XESTINA, or NILGIRIA)

A Colour uniform or nearly so; no spiral bands of colour.

a. Decussated.

- a'. Radula with broad band of median teeth. Left dorsal lobe undwided
- 61. Ariophanta semirugata, Beck (Galaxis), Ind p 42 (1837);

 Pfr (Helix) Mon Hel 1, 1847, p 40, id t c vii, p 75, H & T.

 (Helix) C I 1876, pl 59, fig 4, Nev Hand-l 1, 1878, p 51

 Helix globulus, Mart & Chemn Syst Conch-Cab ix, 2, p 126, pl 130, figs. 1159-60 (1786); nec Mull H-st Ver 11, p 68

Galaxis tranquebarica, Fabr MS 1876, Beck, l c no descr , Pfr (Helix) Mon Hel 1, 1847, p 41, 1d t c vu, p 75, Stol (Helix) J A. S B xli, 1872, 2, p 212 (footnote), Godwin-Austen (Nilgina), Mol. Ind 11, p 78, pl 81 [figs 3-3 d, animal, genitalia, with spermatophore, pl 82, fig 3, radula (1898)], 1d t c 11, p 135 (1899) [c] 04 for 5-5 c spermatophore] pl 92 [figs 2.2 b (1899) [pl 94, figs 5-5 e, spermatophore], pl 98 [figs 2-2 b, anatomy and sculpture]

Shell perforate, globose or globosely conoid to depressedly globose, pale brownish to whitish, finely decussated above with oblique strie and spiral impressed lines, the latter sometimes faint or wanting, smoother below; suture very little impressed;

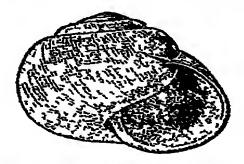


Fig 21 — Artophania semerugata }

whorls 5-6, slightly convex, the last large and swollen, generally descending near the mouth; aperture roundly or ovally lunate, peristome thin, reflected near the umbilicus.

Major diam. 33, min. 28, height 28 mm.

Hab The greater part of the Peninsula of India from the Nerbudda and Son southwards, Cutch (Stoliczka), also in Northern

Ceylon. Common in open country

A very variable shell, the spile especially varying in elevation An average specimen (figured) from Trichinopoly gives the measurements above quoted; others from the same place measure 37, 33, 34, and 33, 30, and 35 mm Another measures 30, 25, 24

A. semirugata is a thinner smoother variety; A. tranquebarica thicker, with stronger sculpture, and more globose

Animal with a triangular right dorsal lobe to the mantle and a

long narrow left dorsal lobe. Foot not divided.

In the generalize distal portion of penis-sheath very long and convolute; the retractor muscle of the male organ is given off from an extremely long diverticulum. A cylindrical kalc-sac, about as long as the epiphallus. Spermatheca bulbous, on a short narrow neck. Dart-sac very large and long

Radula with 54 3.17.1.17 3.54 (74 1 74) teeth in a row: rhachidian tooth tricuspid, the admedians close to the middle have a slight inner cusp, which soon disappears; the outer cusp is

persistent on the admedians and on some of the laterals

62 Ariophanta belangeri, Desh (Helix) in Bélanger, Voy Zool p 43, pl 1, figs 1-3 (1834), Pfr. (Helix) Mon. Hel. i, 1847, p 69, id t. c vii, 1876, p 172, H & T. (Helix) C. I. 1876, pl 29, fig 6

Helix bombayana, Grat Act Soc. Lin Bord. xi, 1841, p. 406, pl 1, fig 1, Pfr Mon Hel. 1, 1847, p 41, id t. c. ii, 1853, p 76, id. t c vii, 1876, p 125, H & T (Helix) C. I 1876, pl. 29, fig. 5, E A. Smith (Xestina), Faun Geog Mald Lac. Is 1902, p. 142

Helix vitellina, Pfr P. Z & 1848, p 109, id Mon Hel iii, 1853, p. 72, id. t c vii, 1876, p 122, H & T (Helix) C I. 1876, pl. 59, figs 1, 2

Shell openly perforate, depressedly globose, obliquely structed, and more or less decussated by impressed lines (often obsolete) above, smoother below, pale tawny to purplish or whitish; spire low, convex, suture impressed; whorls 5-5½, convex, the last much smaller than in A. semirugata, scarcely descending in front, subangulate at periphery; aperture roundly lunate; peristome thin, basal and columellar margins slightly reflected.

Major diam. 46, min. 37, axis 28 mm

Hab. Madura, South Arcot, and Malabar, and probably all the southernmost part of the peninsula Anamalai Hills, N Mahlor Atoll, Maldives (introduced)

The recorded locality Bombay is very doubtful.

The dimensions above given are those of typical A belanger, from Madura. vitellina is a small variety, measuring 29, 24, and 18 mm.; bombayana still smaller (28, 23, 16); on the other hand, a very large shell from Gingi, South Arcot, measured no less than 52, 44, and 31 mm

A belangers may generally be distinguished from A-semirugata by more depressed form, less swollen last whorl, and smaller

aperture Intermediate forms occur

- b The whorls transversely streated, not decussated.
- 63. Ariophanta albata, Blf (Xestina) J A S B 1880, pt 2, p 189, pl 3, fig 3, rd Proc Mal Soc 1v, 1901, p 245
 Helix lucublanda, Ancey, Le Nat. 111, 1886, p 293

Near A belangers, but thicker and more coarsely sculptured with rather irregular oblique impressed grooves, no decussating spiral lines; the colour is white throughout. The shell is intermediate in form between A belangers and A. maderaspatana.

Major diam 29, min 321, height 171.

Hab. Papanassam, in the hills west of Tinnevelly, S. India (Beddome).

64. Ariophanta sisparica, Blf (Nanina-Hemiplecta ^p) J A S B 1866, 2, p 34; Pfi. (Helix) Mon Hel v, 1868, p 122, H & T (Helix) C I 1876, pl 112, figs 4, 5, 6

Shell narrowly umbilicated, depressed, rather thin, striated, white, with a straw-coloured epidermis, having a dull only lustre; spire convex, low, suture flat, linear, submarginate; whorls 4½, flatly convex above, the last not descending, bluntly angulate at the periphery, more swollen and convex beneath; aperture oblique, subovally lunate, white and pearly inside, peristome thin, margins united by a thin callus, columellar margin curved, briefly reflected

Major diam 37, min 30, axis 18 mm., aperture 19 broad,

16 high.

Hab. Sispára Ghat, Nilgiri Hills, about 6000'.

I obtained two specimens of this species in 1864 on the road leading down to Sispára Ghat.

65. Ariophanta novella, Pfr (Helix) P Z S 1854, p 50, id (Helix) Mon Hel iv, 1859, p 34, Rv (Helix) Conch Ic. no 1294, H & T. (Helix) C I. 1876, pl 150, fig 8

Shell obtectly perforate, turbinately depressed, almost lenticular, carinate, rather thin, pale horny, striated, not decussated; spire low, conoid, with the sides slightly convex, suture almost flat; whorls 5, nearly flat above, the last convex beneath, sharply keeled, the keel growing blunt near the mouth, aperture oblique, subtetragonally lunate; peristome thin, columellar margin curved above, almost vertical, briefly reflexed, and partly covering the perforation

Major diam 21, min. 17, axis 10 mm.

Hab Ceylon (Thwaites).

An apparently rare shell, and confined to the hills of Southwestern Ceylon The colour may be darker when fresh, as shown in Reeve's figure.

GG Ariophanta ceraria, Bs (Helix) A M N. H. (2) An, 1853, p 91, Pfi (Helix) Mon Hel IV, 1859, p 67, H & T. (Helix) C I. 1876, pl 28, fig 4

Shell obtectly perforate, depressed, waxy white to pale fulvous

horny, with a dull resinous lustre, plicately striated, sometimes more or less undulated transversely to the whorls above, and decussated by fine subdistant impressed lines, occasionally obsolete, smoother below; spire convex, suture not impressed, whorls 4½-5, rather rapidly increasing, almost flat above, the last more convex, keeled at the periphery, the keel often disappearing near the mouth, convex below, the convexity below the keel deeper than the spire is high; aperture oblique, subovally lunate; peristome thin, columellar margin curved, briefly reflexed, nearly covering the perforation

Major diam 22, min 18, axis 11 mm.

Hab The higher ranges of South-western Coylon, Horton Plains (Layard), Mt Pedro Talia Galla, above Newara Eliya

(H Nevill)

[The anatomy is exactly like that of A. cheaus and the radula has the same formula (see p 44). The two species have very close relationship. A cheaus, however, is from a lower altitude, ranging to the coast-line, whereas cenaria is from the higher ranges of Ceylon (H. B. Preston), a difference of conditions quite sufficient to have brought about dissimilarity in the shells.]

The figures of this shell by Reeve and Hanley are poor The shape resembles that of A bistrialis A. novella is more closely

wound and the sculpture is different

B. Shell spin ally banded with colour more or less distinctly a. Decussated but not grooved

67 Ariophanta ligulata, Fc: (Helix) Hist Nat. pl 31, tig 2 (1819-21), Pfr (Helix) Mon Hel 1, 1847, p 71, id t c vii, 1876, p 122, H & T (Helix) C I 1876, pl 28, fig 9, Nev (Nanna-Xesta) Hand-l 1, 1878, p 50, Godwin-Austen (Helix), J A S B alix, 1880, p 158, t. 11, fig 3 (apimal), id (Nilgiria) Mol Ind 11, 1899, p 123, pl 98, figs 1-1 d (animal, genitalia, and sculpture)

P Nanna tuibinata, Beck, Ind Mol p 4 (1837, no descr), Morch (Cryptozona), Jour Conch ax, 1872, p 336, Pfr. (Helix) Mon

Hel vu, 1876, p 90

Shell narrowly perforate, depressedly globose, finely marked with rather flexuous plicate striction, faintly decussated with subdistant impressed lines, whitish, generally brownish above the periphery and inside each suture, the dark colour forming a spiral band with an indistinct inner boider; spire depressedly conoid, varying in height, apex acute, suture impressed, whorls 5½-6½, slightly convex, regularly and slowly increasing, the last subangulate at the periphery, convex beneath, aperture oblique, lunate, peristome simple, thin, slightly reflected at the base and near the umbilicus

Major diam 26, min 23, height 17 mm

Hab The eastern portion of Peninsular India; known localities are Patna, Bhágalpur (on the Ganges), Mánbhum, Cuttack, Madras, and other places in the Carnatic Except in the height of the spire, there is but little variation

Ariophanta bistrialis, Beck (Nanna), Ind Mol 1, p 2 (1837, descr), Pfi 2n Chemn ed 2, 1846, Helix, no 61, pl 11, figs 10, 11, id (Helix) Mon Hel 1, 1847, p 71, id t c vii, 1876, p 122, H & T (Helix) C I 1876, pl 29, fig 1, Godwin-Austen (Nilgina), Mol Ind 11, 1898, p 80, pl 81, fig 4 (genitalia), pl 82, fig 5 (radula)

Helix ceylanica, Pfr Zeitschr Mal 1850, p 67, id Mon Hel 11, 1853, p 71, id t c vii, 1876, p 122, H & T C I. 1876, pl 29, fig 3, Godwin-Austen (Nilgina), Mol Ind 11, 1898, p 126 [description of animal, genitalia, and radula]]

Helix taprobanensis, Dohrn, Mal Bl vii, 1859, p 206, Pfi. Mon Hel v, 1868, p 116, H & T C I 1876, pl 29, fig 2

? Helix cyix, Bs A M N H (3) v, 1860, p 382, Pfi Mon Hel v, 1868, p. 236, H & T C I 1876, pl 29, fig 4

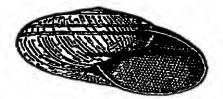


Fig 22.—Arrophanta bistrialis

Shell perforate, subglobosely depressed, thun, finely structed, decussated above with impressed spiral lines, polished below, pale horny, encircled by two rufous lines (one or both sometimes wanting), with a whitish band between them, the upper line continued inside the suture on the upper whorls; spire low, convex; whorls 4½, nearly flat, rapidly increasing, the last not descending, convex beneath, aperture large, oblique, lunately ovate; peristome thin, with the columnlar margin slightly reflected.

Major diam 30, min 25, axis 17 mm, aperture 16 broad and

16 high.

Hab Madras Presidency and Ceylon I found this shell as far north as the Gadávai at Dumagudiam, but I have seen no specimens from the Malabar coastland Large specimens up to 40 mm in size have been obtained on the Shevroy Hills by Mr. J R Henderson

The usual South-Indian form (bistrialis) is pale-coloured and smooth with two rufous lines, the common Ceylon form is darker in colour with a single line (ceylanica); but both varieties occur in each area, and also shells without any bands tapiobanensis is a large rather thick variety from Ceylon; cyix is a dwarf form, rather globose, generally with the colour-lines faint or wanting, from Matelle 1 have also a specimen from Trincomali

Teeth in radula of A bistrialis 50.2.17 1.17.2 50 (69.1.69); of the var. ceylanica 62.2.19.1.19.2 62 (83.1.83) The inner or admedian laterals, like the rhachidian, are tricuspid, gradually losing the side cusps; outer laterals aculeate.

69. Ariophanta basilessa, Bs (IIelix) A M N. H. (3) xv, 1865, p 11, Pfr. (Helix) Mon Hel v, 1868, p 244, H & T. (Helix) C I. 1876, pl 25, fig 2, pl. 52, fig 4

Hemiplecta tinostoma, Blf. J A S B xlix, 1880, p 187, pl. 3, fig. 1.

Hemiplecta emisa, Blf t c p. 188, pl. 3, fig. 2.

Shell narrowly umbilicated, depressed, thick, covered with a sellowish-brown epidermis, beneath the epidermis pale purplish, with a narrow whitish band above the periphery, darker and browner below the band. sculpture subgranular, formed by strie of growth decussated by close, fine, slightly flexuous impressed lines, spire convex, low, suture slightly impressed, more so near the mouth; whorks 4½, the upper nearly flat, the last more convex above, moderately turned below, rounded at the periphery, scarcely or not descending anteriorly, aperture oblique, oblong-ovately lunate; peristome thickened in old shells, especially at the basal margin, columellar margin oblique, reflected, partly covering the umbilicus and terminating abruptly in a small point

Major dram 45 (a large shell 53), min. 38, axis 24 mm.; mouth

23 broad, 17 high.

Hab. Hills near Kottyam, Travancore (Day), Pulneys and Anamalais, 7000' (Beddome) Not known north of the Palghat

Gap

A. tinostoma is much depressed, with an elongate mouth, having the upper and basal margins parallel and the last whorl broad near the aperture and subangulate at the periphery

Major diam 49, min. 40, axis 21 mm, sperture 26 broad and

18 high.

A single specimen was obtained on the Tinnevelly Ghats, east

of Papanassam, at 5000 feet elevation, by Col. Beddome.

A enusa was found, also by Col Beddome, at an elevation of 6000 feet on the top of Aghastyamalai, a hill near Cape Comorin, between Tinnevelly and Tinvancore It is smaller and less thick than typical A basilessa, and the aperture is less elongate

Major diam 46, min 38, axis 29 mm, aperture 24 broad, 19

high

These two forms look very different at first, but they are, I think, varieties of A. basilessa, which, if they are included, inhabits the Tiavancore hills generally, A. enisa, as noticed under A. chenui, passes into that species

Ariophanta gardeneri, Pf: * (Helix) Mait & Chemn Conch-Cab. ed 2, 1846, Helix, no. 703, pl 112, figs 12, 13; ed (Helix) Mon Hel 1, 1847, p 47, ed t. c vii, 1876, p 87, H & T. (Helix) C I 1876, pl 84, fig 7.

Shell subobtectly perforate, turbinate, solid, vellowish brown to dull chestnut, with a narrow pale band round the periphery, subcostulately striated, with a few decussating spiral lines at considerable regular intervals, these lines, formed of raised points on the stries, are continued to the epidermis but are often wanting;

^{*} Transferred to Euplecta, after dissection of the animal ends p 64

spire conoidal, apex acute, suture impressed, whorls 6½, convex, the last rounded at the periphery, not descending; aperture oblique, roundly lunate; peristome simple, blunt, the basal margin rather thicker, columellar margin briefly produced and reflected, nearly covering the perforation

Major diam 21, min 19, axis 14½ mm., aperture 10 broad,

9 high.

Hab. Hills of South-western Ceylon, about 4000 feet elevation,

in forest (Gardener, Nevill).

[From beneath fallen leaves in forest, Uva, 5000 ft. (O Collett).] [For description of animal, see p. 64.]

- b. Sculpture of decussating lines and of oblique shallow grooves and low ridges.
- 70 Ariophanta basileus, Bs (Helix) A. M. N. H. (3) vii, 1861, p. 81, id. t. c. xiii, 1864, p. 407, Blf (Nanina) J. A. S. B. 1866, 2, p. 39. Pfr (Helix) Mon. Hel. v., 1868, p. 120. id. t. c. vii, 1876, p. 124, H. & T. (Helix) C. I. pl. 25, fig. 7, Godwin-Austen (Nilgiria), Proc. Mal. Soc. v., 1902, p. 248, pl. 6 (animal and anatomy)

 Helix titanica, Pfi. P. Z. S. 1862, p. 117, pl. 12, fig. 3

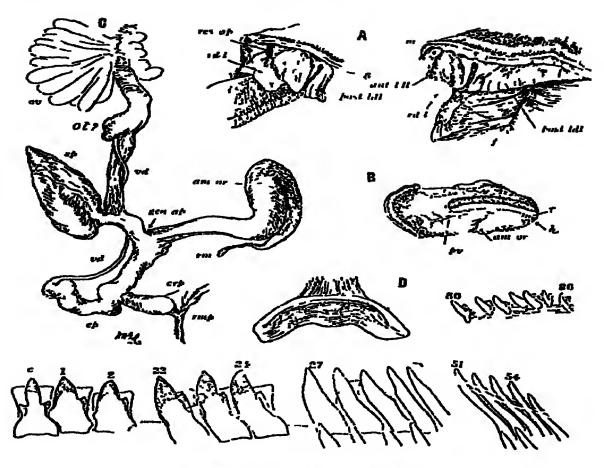
Shell narrowly umbilicated, conoidly depressed, covered with a brownish-yellow deciduous epidermis, beneath the epidermis white, pinkish towards the apex, surrounded beneath the periphery by a broad dark chestnut or blackish band, which is paler below; sculpture consisting of strime covered by a few impressed spiral lines and of irregular, shallow, slightly oblique grooves, often more or less obsolete; spire convexly conoid, apex obtuse, suture scarcely impressed; whorls 5½, almost flat above, the last not descending, convex beneath, angulate at the periphery; aperture oblique, ovally lunate, peristome thin, straight, columellar margin expanded and briefly reflexed, partly covering the umbilicus.

Major diam 72, min 62, axis 38 mm.; aperture 38 broad, 16 high.

Hab. Anaimalar teak-forest, 2000-3000 feet above the sen, west

of the main range of hills.

A. basileus is the largest of Indian snails. It has not been found north of the great gap in the Sahyadri range at Palghat. The shell is very similar to that of the Siamese Hemiplecta distincta, Pfr., but the animal, for a specimen of which I am indebted to Mr. Thurston, proves on examination to be a true Ariophanta. The genitalia resemble those of A. solata. The radula is very broad and the formula for the teeth 56.2.28.1.28 2.56 (86.1.86), [which is almost identical with that of A chenui. The centre tooth is tricuspid, the admedian teeth are elongate with a cusp on the outer side, the laterals are aculeate, slightly curved in form, they become shorter and more slender, and the outermost are blunt and minute, resembling those of Ravana politissima?



[Fig 23 -Arrophanta basileus

A Mantle-margin (m), showing dorsal tobes s, slit between the anterior and posterior lobes, f, foot, sole of

B Animal, shell removed, viewed from left side, showing (r) renal organ and

B Animal, shell removed, viewed from left side, showing (r) renal organ and position of heart (h) and amatorial organ within the visceral sac, also the pulmonary vein (pv)

O Generative organs, separated out ×23

D Jaw and teeth of the radula at various points in the row

For explanation of letters in italics and numbers see figs 2, 3, 4, and 16]

71 Ariophanta beddomii, Blf (Hemiplecta) A M N H (4) xiv, 1874, p 408, H & T (Helix) C I 1876, pl 159, fig 10

Similar to A basileus, of which the present species may be a variety, but smaller, thinner, and more depressed. The sculpture and coloration are identical with those of some forms of the larger shell

Major diam 51, mm. 41, axis 24 mm., aperture 20 broad by 21 high

Hab. Travancore Hills, west side, south of Peermede.

72 Ariophanta (Xestina) chenui, Pfr (Helix) Zeitschi Mal 1847, p 145, id (Helix) Mon. Hel i, 1847, p 438; H & T (Helix) C I. 1876, pl 25, fig 1, pl 27, fig 4, Nev (Nanina-Hemiplecta) Hand-l 1, 1878, p 47, Godinin-Austen (Nilgiria), Mol Ind 11, 1898, p 124, pl 95, figs 1-9 (animal and anatomy), pl 98, fig 3 (sculpture)

Hemiplecta simoni, Jousseaume, Mém Soc. Zool Fi vii, p 282 (1894).

Shell openly perforate, depressed, rather thin, fulvous, with a narrow pale band, often indistinct, above the periphery, and a darker, ill-defined, rufous-brown band, fading away beneath, below the same, sculpture decussated, stripe of growth and impressed spiral lines occurring throughout, the upper surface of the last whorl marked with shallow, irregular, slightly oblique ridges and furrows, resembling hammer-marks on metal; spire low, convex, suture slightly impressed, more towards the mouth, whorls 4½, flattish above, the last more convex, slightly angulate at periphery, more swollen below, aperture oblique, ovately

lunate; peristome slightly thickened.

[The right shell-lobe is represented by a very small flap, situated near the respiratory aperture, this flap is an expansion on the dividing line of the dorsal lobe and narrows backward towards the posterior margin of the mantle-zone, which, on the bodywhorl side and viewed from the inside (that is, the surface next the shell), is seen to form a distinct band with an equal breadth of 2½ mm. contracted. Compare this also with the right shell-lobe of Ratnadupia and Ariophanta liquiata The left shell-lobe is also a narrow fillet overlapping the peristome, 2 mm. broad, but it has no tongue-like process on the left margin dorsal lobe is triangular and ample. The left dorsal lobe is in two distinct parts, the anterior being the largest, and it distinctly overlaps the smaller narrower posterior lobe; in this respect it differs from typical Nilgiria solata and other species of the genus, where no division of this lobe is found, and yet it is not division of the same kind as is seen in Arrophanta lævipes, &c

The generative organs are very similar to those of Nilgiria

solata

The central and median teeth have large cusps on both sides At the 20th tooth the cusps become very small, at the 23rd the inner disappears, and at the 25th there is no trace of the outer, the laterals are aculeate, the marginals are short and bicuspid to straight and blunt The jaw has a flat convexity on the cutting-edge.]

Major diam. 44, min. 36, axis 21 mm.; aperture 23 broad,

18 high

Hab. Hills of SW. Ceylon; Matelle (Layard), Kandy (Bed-

dome), Ambagamuwa District (Collett)

The chestnut band below the periphery is sometimes narrow, sometimes broader. The eggs are described by Collett as oval, pointed at the ends, 8 mm. long and 4 wide, white, soft (uncalcified),

and sulcated longitudinally. Teeth of radula 58 1 25.1.25.

1.58 (84.1.84).

A shell, of which there are in the British Museum three specimens, collected by Mr Thwaites, probably near Kandy, has been identified by Pfeiffer as a variety of the present species. The sculpture is, however, finely decussate, without the characteristic furrowed markings of A chenic, and the shells are scarcely distinguishable from the Travancore variety or subspecies of A. basilessa already described (p. 40) as A emisa

Hemiplecta simoni is founded on the variety with a slightly raised spire represented in pl. 27, fig. 4 of Harley and Theobald's

'Conchologia Indica.'

c. Whorls transversely structed, without decussation or grooves

73 Ariophanta (Xestina) juliana, Gray (Nanna), P. Z S 1834, p 58, Pf: (Helix) Mon Hel 1, 1847, p 44, 1d t c 11, 1876, p 79, H & T (Helix) C I 1876, pl 52, fig 7 Helix ganoma, Pf: P Z S 1853, p 124, 1d Mon Hel 1v, 1859, p 22, 1d t. c vii, 1876, p. 79, H & T C I. 1876, pl 111, figs 4-7.

Shell openly perforate, depressedly turbinate to conoidly depressed, solid, smooth, striated, without decussating spiral lines, pale straw-coloured to pink, with a narrow brown or

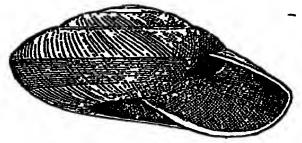


Fig 24.- Arrophanta juliana

chestnut spiral band below the suture, another, much broader, below the periphery, and a circular blown area around the umbilicus; spire convexly conoid, apex blunt, suture slightly impressed; whorls 5, slightly convex above, the last subangulate at the periphery, moderately swollen below, not descending; aperture oblique, broadly lunate; peristome simple, straight, blunt, columellar margin produced and dilated partly covering the perforation

Major diam 48, min. 41, axis 27 mm, aperture 24 broad,

20 high

Hab. South-western Ceylon

The typical form is rosy pink banded with chestnut H. ganoma is a straw-coloured variety with blown bands, and generally more depressed The type of H. ganoma measured 51, 41, and 26 mm in the three dimensions, a smaller specimen gives 41, 34, and 20.

This variety has been recorded from Bentota (A. vill) and Cotta,

near Columbo (Collett), both at the sea-level.

[The animal of a specimen from Cotta, Ceylon, is externally like that of A. ligulata, and, as in that species, there is not the slightest sign of a right shell-lobe. The left dorsal lobe is continuous, but a slight slit with overlap occurs on it at 16 mm. from the respiratory orifice; this may also be observed in A chenui. This lobe is very narrow for its whole length. The genitalia are typical of the genus Ariophanta. Penis with a long retractor cocum, a small sessile spermatheca; the amatorial organ long, bent on itself, with a large blunt point.

The teeth of the radula are similar to those of A chenu:

74. Ariophanta maderaspatana, Gray (Helix), P. Z S 1834, p. 67;

Pfr (Helix) Mon. Hel-i, 1847, p 63; 2d t c. 17, 1859, p 54;
2d t c vii, 1876, p 118, H & T (Helix) C I 1876, pl 28, fig 2.

Shell openly perforate, depressedly globose, thin, rugosely stricted, dull brownish rufous above, passing into white on the inner side of each whorl, paler or whitish beneath, generally with a white or whitish band round the periphery, occasionally whitish

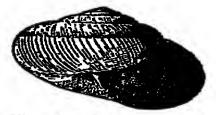


Fig 25 — Arrophanta maderaspatana

horny throughout, sometimes dark rufous speckled with white, spire depressedly convex; whorls 5½, convex, the last rather more swollen, not subangulate at the periphery in adults; aperture oblique, roundly lunate; peristome simple, thin, very slightly expanded, the reflected portion increasing in breadth near the perforation.

Major diam. 32, min. 26, axis 19 mm.

Hab. The higher parts of Mysore, the Nilgiris, Kolamalais, Shevroys, and locally at lower elevations, as on Chittycolum Hill,

north of Trichinopoly, at about 1500 feet above the sea.

An almost uniformly coloured isabelline variety, with more convex whorls and impressed suture, occurs above 6000 feet on the Nilgiri and Palni Hills, and has in the first-named locality a black mantle and the body light tawny This is var. β of Pfeiffer. The common form has both animal and mantle grey.

[Specimens from the Palni Hills have the mantle of the same colour as the rest of the body. The right dorsal lobe is triangular in shape, the left broad and continuous from the respiratory orifice

up to the umbilical region as in A. solata and tranquebarica.

The male organ has a long excum, to which the retractor muscle is attached, and a short kalc-sac. Spermatophore like that of A tranquebarica. Spermatheca small, globose, on a short stalk A very large stout cylindrical amatorial organ.

The centre and admedian teeth of the radula are tricuspid as in bajadera; the lateral teeth have the outer cusp much below the point, which gradually becomes very small, so that the outermost

appear to be nearly aculeate. The formula is

75. Ariophanta gassii, Blf. (Beddome MS) Proc Mal Soc 1v, 1901, p 249, pl 25, fig 3

Shell subobtectly perforate, depressedly globose, thin, rugosely striated, dark fulvous to pale chestnut above, with usually a dark rufous band above the periphery, sharply contracted with a whitish peripherial band, more or less defined; spire low, conoidly convex, suture impressed; whorls 6, convex, the last broader, not descending, subangulate at the periphery, convex beneath; aperture oblique, subovally limate; peristome in month white, slightly obtuse, columellar margin oblique, very slightly curved, scarcely expanded till close to the umbilical region, where it is abruptly and rather broadly reflexed, almost covering the perforation.

Major diam 36, min. 29, axis 21 mm.

Hab. Travancore Ghats, Anaimalais, Pulneys, and perhaps the higher ranges generally between the Pálghát Gap and Cape Comorin.

Immature specimens of a variety, also from the Travancore Ghats, have a lower convex spire, and a well-defined narrow white band just above the periphery, with a dark rufous border beneath, which fades gradually into the pale lower surface Another variety appears to be indicated by a somewhat depressed

specimen from the Pulneys in the British Museum.

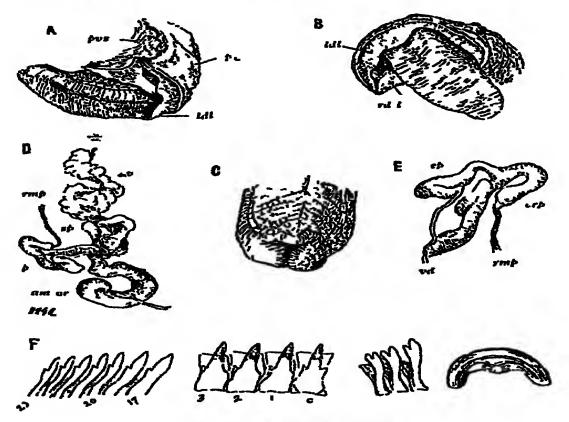
This shell is distinguished from A. maderaspatana by rather larger size, narrower perforation, subangulate periphery, darker and more uniform coloration, and by the form of the peristome. The columellar margin in A. maderaspatana is slightly expanded throughout, and the amount of expansion increases gradually at the perforation, whilst in A gassis there is scarcely any expansion till close to the perforation, where the margin is abruptly reflexed It is, however, by no means improbable that the two pass into each other. A variety of A made aspatana which occurs in open ground on the plateau of the Nilgiris should perhaps be referred to A gassis. It is distinguished by the dark colour of the animal and shell, the mantle being black.

76 Ariophanta solata, Bs (Helix) A M. N H. (2) 11, 1848, p 159, Pfr (Helix) Mon Hel 111, 1858, p 67, td t c 11, 1859, p 170, td t c 11, 1876, p 274, H & T (Helix) C I 1876, pl 28, fig 6; Godwin-Austen (type of Nilgiria), Mol Ind 11, 1898, p 77, pl 80, figs 1-4 (anatomy), pl 82, fig 2 (radula)

Shell perforate, subglobosely depressed, smooth, striated,

thicker than maderaspatana, white, often with a bluish tinge, washed with brownish on the last whorl, with a narrow, spiral, rufous band inside the suture and traces of other bands, and with numerous small, brownish, translucent spots irregularly distributed; spire very low; whorls 5½, flatly convex above, the last slightly subangulate at the periphery, moderately swollen beneath; aperture oblique, lunately ovate, generally rufous within; peristome simple, thin, columellar margin reflexed.

Major diam. 26, min. 21, axis 15 Hab. Nilgiris.



[Fig 26.—Arrophanta solata

- A Animal viewed from right side, showing edge of mantle- and dorsal lobes
- B Animal viewed from left and front side, showing sole of foot

 O Extremity of foot, showing muccus gland
 D Generative organs

 E Generative (male) organ

 F Radula and Jaw

For explanation of letters in italics and numbers see figs 2, 3, 4, and 16]

[Animal The right dorsal lobe is small, the left long, narrow, and continuous. Sole of foot not divided, in spirit puckered and wrinkled transversely. The mucous pore is overhung by a slight blunt process.

Peripodial line distinct, above a broad margin. In the generative organs the amatorial is solid and cylindrical with a retractor muscle; in the male organ there is a stout and long cocum-like

48 ZONITIDÆ

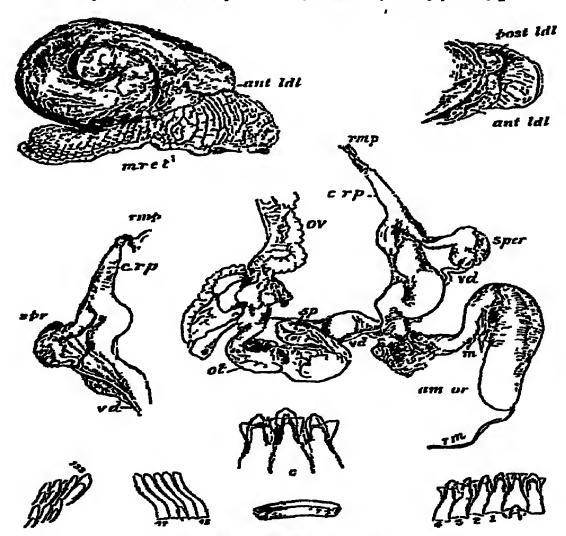
process, at the head of which the retractor muscle is given off. The spermatheca is short and pear-shaped. The radula teeth are

arranged. 35.2.15.1 15 2.35, or 52.1.52.

The central tooth is strongly tricuspid, the adjacent teeth are hardly tricuspid, only showing un exceedingly fine notch on some of the teeth on the inner upper margin; the laterals do not decrease much in size outwards and are evenly bicuspid ?

Subgenus INDRELLA.

Indrelia, Godwin-Austen, Proc Mal Soc 18, 1901, p 187, pl. 18



[Fig 27 —Indrella ampulla

Animal with shell removed from right side, head from above ×08 The genitalia, ×18; the jaw and the teeth of the radula, ×144 spr & sper., spermatophore, position of, m, muscle attachments, mret, muscle attachment of right eye tentacle, beneath integument

For explanation of letters in Italics and numbers see figs. 2, 3, 4, and 16]

Type, I. ampulla (Bs.).

Range. Western slopes of Syhadri Range in Malabar.

Shell Vitrina-like, imperforate, with few whorls and a very

large aperture

Animal similar to that of Ariophania, but larger, not fully retractile within the shell. Mucous pore of moderate size; no distinct overhanging lobe or a small one. Sole undivided, very smooth. No shell-lobes, dorsal lobes well developed, the lett divided into an anterior and a posterior part by a deep sinus. Kalc-sac small, receiving the vas deferens, retractor muscle attached to long straight cæcum given off at the junction of the flagellum of the male organ. Spermatheca oval, very short, on a short stem. Amatorial organ (dart-sac) stout and long. Jaw straight, with a slight convexity on cutting-edge, no median, projection. Radula broad, with about 100 rows of teeth: 145.17.1.17 145; median tooth and the 17 on each side (admedians) long, broadly pointed, straight-sided, lateral cusps indistinct, laterals curved, aculeate, outer laterals bicuspid

77. Indrella ampulla, Bs (Helix) A. M N H (2) v, 1850, p 213, Pfr. (Helix) Mon Hel III, 1853, p 27, id t c IV, p 9, id t c vii, 1876, p. 57, Blf J A S B xxxiv, 1866, p 39, H S T (Helix) C I pl 25, hg 4, Nev (Nauna) Hand-l 1, 1878, p 54; Godwin-Austen, Proc Mal Soc IV, 1901, p 187, pl 18 [aumal and anatomy]

Shell imperforate, obliquely ovate, globose, very thin, half the thickness consisting of epidermis, marked throughout with plicate lines of growth, crossed by faint impressed spiral lines, and on

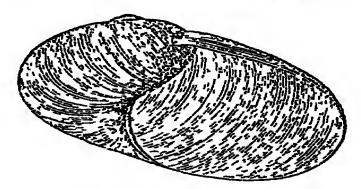


Fig 28 —Indrella ampulla

the last whorl by shallow irregular furrows, brownish olive, sometimes darker brown, spire small, convex, obtuse; whorls 3½, iapidly increasing, the last much larger, rounded at the periphery and beneath, aperture very large, oblique, roundly oral, the same colour within as without, but smooth and glossy, peristone thin, membranaceous, columellar margin much curved inwards

Major diam 50 (a large shell 63), min 38, axis 30 mm.; aperture (obliquely) 32 broad, 30 high

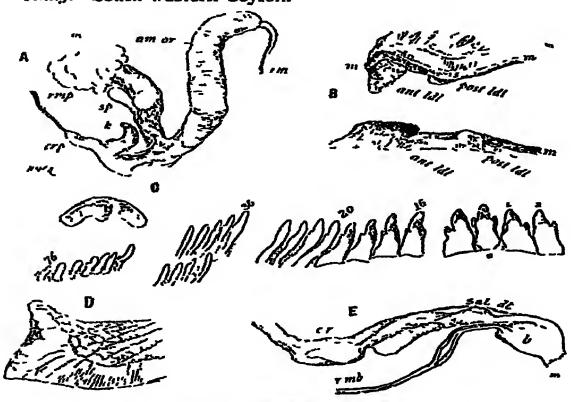
11ab On the western slopes of the Wynaad, Nilgiri, and

Anannala: hills at moderate elevations (3000')

The animal, as represented in a drawing for which I am indebted to Sn Walter Elliot, is greenish yellow, but according to Col Beddome it is black. It probably varies. Beddome found it feeding on large fûngi.

Genus RAVANA

Rayana, Goduin-Austen, Proc Mal Soc. 14, 1901, p 201 Type, R politisama (Pfr.). Runge South-western Ceylon.



[Fig 29,-Ravana politissima

A Genitalia, detached $\times 3$

B Mutle-maign (at) viewed from the left side, lower figure from the underside, showing dorant lobe × 3

O Jaw and teeth of the radula from different parts of the 10w × 244

D Extremity of fout with nuceous gland × 53

I Buccal mass and salvary glands, the latter are not in their natural position, owing to a twist in the intestine ci, crop, b, buccal mass; m, mouth, , mb, retractor of the buccal mass]

Shell like that of Maciochlamys, perforate, depressed, thin, smooth, and horny

Animal (of R politissima) without shell-lobes; right dorsal lobe moderate, the left divided into a large anterior and a small posterior lobe with a wide interval between them. Sole narrow, undivided, truncated behind; mucous pore large, overhung by a large lobe. Kalc-sac short, curved, rather pointed at the free end, receiving the vas deferens at about one-third its length from the junction with the diverticulum leading to the retractor muscle; [retractor muscle attached to a cæcum ,] penis-sheath short, distally to the junction sharply bent, the two segments of the bend held together by a muscular band; diverticulum stout, simple Spermatheca very short Amatorial organ (dart-sac) very large, much larger than penus Jaw arched, with a median projection. Radula broad, with a broad median tract, the teeth-formula being 56.2.18.1 18.2.56 (76.1.76); rhachidian tooth broad, with a large cusp on each side, the 18 inner laterals or admedians each with a single well-marked cusp on the outer side; outer laterals narrow, long, aculeate, the outermost marginals very short

The only species known was regarded as a Macrochlamys until the anatomy was examined. Possibly some other thin, horny, depressed shells from S India or Ceylon belong to the present

genus

78 Ravana politissima, Pfr (Helix) P Z S 1853, p 125; id (Helix) Mon Hel iv, 1859, p. 45, H & T (Helix) C I 1876, pl 31, figs 8, 9, Godwin-Austen, Proc Mal Soc iv, 1901, p 261, pl 36

Shell openly perforate, depressed, thin, polished, greenish or castaneous borny, striated beneath the epidermis, and marked with faint impressed spiral lines, not perceptible in fresh shells. spire low, obtuse, suture deeply impressed Whorls 4½-5, convex, regularly increasing, the last rounded, not descending; aperture slightly oblique, roundly lunate, peristome simple, nearly in one plane, thin, the margins converging, columellar reflected above.

Major diam. 24, min 20, axis 11 mm

Hab. The hills of South-western Ceylon, at an elevation of about 3000 feet, Pusilawe (Layard); Watawale (Collett)

Genus EUPLECTA.

Euplecta, Semper, Reise Phil, Wiss Res in, p 14 (1870), Godwin-Austen, Proc Mal Soc ii, 1899, p 173; id Mol Ind ii, 1898, p 96, pls 87, 97, Blf Proc. Mal Soc iv, 1901, p 246

Type, E subopaca, Pfr

Range. The Indian Peninsula and Ceylon Nearly all the species are confined to the neighbourhood of the western coast of India and the mountains of S.W. Ceylon.

Shell perforate (rarely imperiorate), of moderate size, depressed turbinate, turbinate or trochiform, rather closely wound, generally structed or costulate above, the ribbing decussated by impressed lines and in many species bearing lows of small moniliform tubercles, smoother below, peristone thin, columellar margin more or less reflected

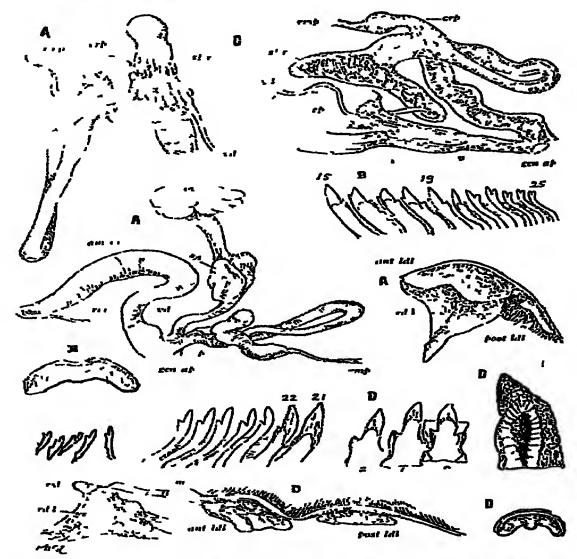


Fig 30 - 4 Euplicia partita, p 65 Genitalia ×33, part of the male organ showing spermatophore forming near the junction of the var deferens, ×6, and the dorsal lobes, × 33

- B Euplecta semidecussatu, p 57
- C Euplicia binouncusis, p 62 Part of generative organs showing spermatophore in process of formation, ×94
- 1) Fupleria presentations, vide travail sica, p 50 Shell- and dorsal lobes, × 33, jam, × 6, and teeth of the radula, × 276, and the extremity of the foot, mucous gland with overhanging lobe, \times 6

For explanation of letters in italies and numbers see figs 2, 3, 4, and 16]

EUPLLOTA. 53

The shell differs, as a rule, from that of Arcophania by having more whorls and being more closely wound, but there are

exceptions Most of the species are calinate.

Animal externally much like An coplanta A large nucous porce at the posterior extremity of the toot, sometimes with a small lobe above it. Shell-lobes generally wanting, the right sometimes present in a minute or rudimentary form; dorsal lobes moderate in size, the left in two parts. The sole indistinctly folded in the middle when contracted.

In the generalia the most important character to distinguish this genus from Ariophania is the presence of a muscular band, given off from the retractor muscle and holding part of the penis doubled into a loop. Apart from this looped ariangement, the male organ is elongate and simple, with the retractor muscle attached to a longer or shorter straight cacum as in Ariophania. Amatorial organ and other appendages as in Ariophania. Spermatheca very short. Vas deferent leading to junction of kale-sac and epiphallus. Spermatophore as in Ariophania.

Ridney short Radula [out of 11 species examined, 9 have the admedian band of teeth a little more than half as wide as in Ariophanta, in proportion of 28 42 respectively]. Jaw with or

without median projection

[Before commencing the list of species in the genus Euplecta, it becomes necessary to refer to the position of one of Semper's types, viz E layardi, Ptr, to avoid possible confusion in the future Dr W. T Blanford in his MS makes Helia baconi from Moradabad, subdecussata from Bombay, and layardi from Ceylon one and the same species—figuring the shell of layardi under the name of baconi, this name of Benson's having priority. The very little we know of Helia baconi does not bear out this conclusion and I am constrained to keep all three species separate, for reasons given further on, as well as our knowing nothing of the animal of true H baconi from Moradabad nor of subdecussata from Bombay Blanford's MS is as follows under no 81, Euplecta baconi=layardi.]

An examination of the type of Benson's Helix bacon has shown that it is an immature shell of H. subdecussata, Pir, which is the Indian form of the Ceylonese H layard: If convexiuscuta is a small form of the same species Pleiser's original description of

H. layardi was also taken from an immature shell.

Large specimens from Ceylon measure as much as 18 mm in

major diameter small shells from Orissa only 12

E subdecussatu (or rather E bacon), the Indian form but also occurring in Ceylon, is rather more closely wound than the Ceylonese E layards, but there is variation in this respect. The two, however, may be regarded as races or subspecies

Specimens from Baticaloa and Hambantote on the east coast of

Ceylon are full ous horny

The whorls of *E. baconi* were said in the original description to be bordered by a narrow dark rufous band. This cannot now be detected

The animal of *E baconi* is said to have "only a small right lobe ('shell-lobe), very small projections above the narrow compressed mucous gland, furrows of the sole of foot indistinct, livid colour, blackish on the mantle, round the pulmonary orifice" (Stoliczka,

quoted by Nevill, 7 c)

[The best recorded series of the three species in question, with accurate localities, is in the Indian Museum, Calcutta, and Geoffrey Nevill keeps them distinct in his Hand-list. Taking his II bacom first, we cannot discard Benson's description of the whorls being ornamented by a rufous band, although, as Blauford says, this cannot be detected in the shell bearing this name in the McAndrew (Benson's) Collection at Cambridge. This may be due to bleaching. Benson's collection, after his death, did not receive the care that it should have "India" was substituted for Benson's precise localities, many of the types are not now to be found, and so-called types are not in every case to be depended on, and now require to be verified by specimens collected in the typical localities.

I have before me a book from the Indian Museum Library, "Drawings of the Animals of Helicida executed under the Super-intendence of the late Ferd Stoliczka" Among these is the water-colour drawing of the shell and animal from life of a specimen taken in the "Botanical Gardens, Calcutta, got it also from Moisraka" marked "subdecussata?" in Stolicza's handwriting—

"N bacon, Bs," entered afterwards, in that of G Nevill

The shell is shown with a jufous band on the upper whoils, which in the present connection is a most important point, because no band of this sort is to be seen in Emplecta layardi and the closely allied species from Ceylon Stoliczka's description in this book of this animal is as follows — "subdecussata" We must remember these notes were slight, made for his own use, and not for publication "Only a small right lobe, horn above gland small, livid coloured, blackish on the mantle round the pulmonary orifice, pedicles dark, the furrows on the sole indistinct."

In Nevill's Hand-list, p 35, no. 134, Nanina (Sitala?) bacon, Benson, we have not the above original description, but one drawing, and Blanford (see above) quotes Nevill's description, which is incorrect and unmeaning in this sentence, "very small projections above the narrow compressed mucous gland" Nevill was looking at the figure, which is a very detailed drawing by the native artist, size of life, and he did not make out that the said projections were below the hooked gland (which is well seen with a lens), and represent the termination of the foot behind on the level of the sole

Nevill records this species (baconi) in the collection from Benaies (2), Moisraka and Calcutta (20), Chandbali (2), Kulu Valley? (1) From Benares, Moradabad is distant some 350 miles further to the noith-west, from Calcutta 650 miles. I may remark here that these shells had never been compared with the type, the

^{* [}There are no furrows on the sole Sole here, I suggest, refers to foot and the furrows to the perspedial grooves]

single specimen of which Nevill had never seen, so that there is very considerable doubt whether his determination is correct Turning next to No. 133, p. 34, Nanna (Sitala?) subdecusuita, Pfeiffer, it is clear that Nevill considered this species distinct from No. 134, and he gives as the locality Madras (10) and Poorce (Raban, 2), var. (? distinct species) Trichinopoly (1), Stoliczka these had apparently not been compared and verified with the species from the typical locality Bombay, on the opposite coast of India so far, this identification is unsatisfactory. No 128, Nanna (Sitala?) layardi, Pfr., p. 34: Nevill's record is all from Ceylon, includes shells given by Layard himself, and Nevill clearly distinguished them from No 133 and No 134]

A. Shell turbinate or subturbinate, thin, horny, finely decussated above.

79. Euplecta layardı, Pfi (Helix) P Z S 1851, p 253, ul Mon Hel in, 1853, p 55, ul t c vii, 1876, p 101, Sempei (Euplecta), Reise Phil, Wiss Res in, 1870, p 14, pl 3, hgs 3, 4 (anatomy); H § T (Helix) C I 1876, pl 56, figs 8, 9; Nei (Nanna-Sitala) Hand-l 1, 1878, p 34

Helix convexiuscula, Pfr P Z S 1855, p 91, id Mon. Hel iv, 1859, p 35, H & T. C I 1876, pl 128, ngs 5, 6

Shell perforate, depressedly turbinate, thin, whitish horny,



Fig 31 —Enplecta layardı

finely decussated above with oblique stile and spiral compressed lines, the latter occasionally faint or wanting, smoother and radiately strated below, spire conoidal, apex subscute, suture slightly impressed, whorls 6, moderately convex above, the last keeled, more or less bluntly, convex beneath, aperture slightly oblique, roundly lunate, sometimes angulate, peristome thin, columellar margin vertical above, briefly reflexed, nearly covering the perforation.

Major diam 16, min 13½, height 11 mm.

Hab Ceylon, Kandy (Nevill), Baticaloa, Hambantote (P. eston).

80 Euplecta subdecussata, Pfr. P Z S 1857, p 107, vd Mon Hel 1v, 1859, p 28, H & T C I 1876, pl 56, fig 4, Nev (Nanna-Sitala?) Hand-l 1, 1878, p 34.

[Shell perforate, turbinate, thur, irregular plicate striation, above the spiral lines obsoletely decussate, transparent, glassy green, spire conical, apex obtuse, whoils 6, slightly convex, the last not descending, periphery subcarnate, base convex, polished, aperture oblique, widely lunate, peristome simple, straight, margins remote, columellar scarcely reflected.

Major diam 14, min 12, axis 9 mm

Hab. Near Bombay.

I have specimens from Poons, from one of which I extracted the ladula, but could not count the lateral teeth, which were broken up The admedian formula was +2 12.1 12.2+ (or +14.1 14+). Jaw moderately arched, with a contral projection?

Nevill records this species from Madias (W. T. B) and Pooree

(Raban)

81 Euplecta? baconi, B: (Helix) A M N H (2) vi, 1850, p 251, Pf. (Helix) Mon Hel in, 1853, p 55, id t c vii, 1876, p 105, II & T. (Helix) C I pl. 56, fig 7, Nev (Nanina-Sitala?)

Hand-l 1, 1878, p 35

[Shell narrowly perforate, depressedly turbinate, very thin, transparent, pale horny, above slightly shiny, beautifully decussate with wavy striation, below polished, radiately striate; spire slightly elevated, slowly increasing, apex obtuse, dark; suture impressed, whorls 5, subconvex. Upper surface with a narrow dark red band, at last obsolete on the margin, the last subcarnate, beneath convex, aperture subvertical, subquadrately lunate, peristome acute, columellar margin vertical, rounded on the basal margin, above very shortly reflected. (Taken from Benson's description)

Major diam. 14, mm. 13, axis 7 mm

Hab Rare in the Robilla Country near the town of Moradabad (on bank of Gungun River), Northein India (Dr J F Bacon)

Mi F A Potts, the Assistant Superintendent, University Museum of Zoology, Cambridge, replying to my letter regarding this species, says —" We have the type of Heliv bacons, Bs, it shows a narrow fuscous band between the whorls"

Nevill records this species from Bennies and Calcutta, there is considerable doubt as to the accuracy of the identification, and until the anatomy of the animal is examined the generic position

is equally doubtful]

82 Euplecta acalles, Pf. (Helix) P. Z S 1856, p 327, id (Helix)

Mon Hel iv, 1859, p 34, H & T (Helix) C I 1876, pl. 128,
igs 1, 4

Very similar to E layardi, but lower in spire, being more depressedly turbinate and more sharply carmate. A thin whitish horny shell, finely decussated above

Major diam 13, mm 11, axis 7½ mm

Hab. Algus (Conway Shiplay) This shell does not appear to have been obtained by later observers

83 Euplecta pulchella, Bif P Z S 1904, n, p 447, pl 25, fig 18.

Shell subobtectly perforate, conoidly depressed, sublenticular, rather solid, amber-coloured, decussately stricted above and below, or namented above by minute, oblique, granular, flexuous ridges,

crossed by impressed spiral lines, smoother and polished beneath, spire conoidal, apex obtuse, suture impressed, whorls 5, convex, the last descending a little towards the mouth, bluntly angulate at the periphery, convex beneath, compressed around the pertoration, aperture large, diagonal, roundly lunate, peristome thin, arcuate above near last whoil, columellar margin oblique, expanded, more broadly above, and thickened, partly covering the perforation.

Major diam. 11½, min 10, height 6½ mm

Hab Anaimalai Hills (Beddome)

This is a peculiar form to be recognized by its large diagonal aperture and granular sculpture, which is easily seen under a good lens.

Euplecta? mucosa, W & H Blf

[Transferred to end of this genus, after other doubtful species placed in it]

- B Depressedly turbinate, or turbinate or lenticular, generally sharply keeled, with granular costulation or striction on upper surface
- 84. Euplecta semidecussata, Pfi (Hehr) P. Z S 1851, p 252, ed (Hehr) Mon Hel in, 1853, p 53, ed t c vii, 1876, p 105, H & T (Hehr) C I 1876, pl 58, figs 1, 2, Nev (Namua) Hand-l i, 1878, p 29, Godun-Austen, Mol Ind ii, 1898, p 101, pl 97, figs 2-2 d (anatomy), pl 98, fig 5 (sculpture of shell) Euplecta transpetata, subsp, Blf Proc Mal Soc iv, 1901, p 249, pl 25, fig 9

Shell subobtectly perforate, depressedly turbinate, white, with a fulvous to dull chestnut epidermis, striated, the striation broken and decussated by impressed lines, which are less distinct below, spire conoid, apex acute, suture impressed, whorls 7, slowly increasing, convex above, the last not descending, angulate (varying from subangulate, or even rounded, to carinate) at the periphery, more convex below than above; aperture oblique, angulately lunate; peristome straight, slightly obtuse in adults, columellar margin briefly reflected, partly covering the perforation

Major diam 33, min 30, axis 19 mm

or

[Animal Sole of foot not divided, in spirit folded on the central line. There is a minute rudiment of a right shell-lobe, the left dorsal is in two parts, the anterior very close to the posterior. The male organ has a large loop formed by a strong connecting muscle a short distance above the generative aperture. The spermatheca is short and globose. Jaw has a very slight central projection (fig. 30 B, p. 52). Radula (fig. 30 B) formula.

Hab South-sestern Ceylon; Rambodde (Nevell); Ambagamuna

(Collett), amongst fallen leaves in forest and scrub, Travancore hills (Beddome)

This shell varies in colour, form, and size. The decorticated shell is almost white, the epidermis varies in colour from straw-colour to chestnut. The typical form is carrinate, but there is a variety, usually thicker, the var. solida of Hanley (Conch Indica, pl 58, fig 2, p 27), in which the periphery is subangulate or even rounded, and two specimens in Mr Sykes's cabinet measure respectively 38, 32, 21 mm, and 32, 29½, 21 in their three dimensions, the smaller specimen being much the higher in the spire

E transpetata, the variety from Travancore obtained by Beddome, is thinner, and chestnut in colour, it is also of small size,

the largest specimen measuring 30, 271, and 181 mm.

*85. Euplecta rosamonda, Bs (Helix) A M N H (3) v, 1860, p. 381 Pfr Mon Hel v, 1868, p 77, H & T (Helix) C I. 1876, pl 59, figs 5, 6.

Distinguished from *E semidecussatu* by being turbinate and having a much higher spire. The last whorl is rounded at the periphery and tumid below. The upper whorls are more convex and the sculpture decussate and granulate

Major diam 37, mm. 33, axis 24 mm, according to Benson, but the figure in Hanley measures major diam 36, axis 27, and there is one specimen with these dimensions in the McAndrew Collection at Cambridge.

Hab Matelle (? Matale N of Kandy), Ceylon (Layard)
This is in all probability a turbinate variety of E semidecussata

86 Euplecta subcastor, Beddome (Namua), P Z S. 1891, p 313, pl 29, figs 1-3

Shell perforate, lenticular, sharply keeled, deep fulvous, rugately strinted above, smoother below, decursated throughout with sub-obsolete impressed lines, spire low, conoid, with convex sides, suture scarcely impressed; whorls 6½, gradually increasing, almost flat above, the last compressedly keeled, moderately convex below, not descending; aperture oblique, angularly lunate, peristome white, obtuse, columellar margin oblique. curved, very briefly reflected above

Major diam 31, min 28, axis 13½ min

Hab Myhendra Hill, S Travancore, about 2500'

A shell sent by Mr. W M Daly from the Kadai district of Mysore is very similar and may be regarded as a variety. It is much smaller, measuring 25 mm in major diameter.

87. Euplecta travancorica, Br (Helix) A M N II (3) vi, 1865, p 13, Ifi (Helix) Mon Hel v, 1868, p 130, II & T (Helix) C I 1876, pl 50, fig 6, pl. 149, fig 7

⁹ Helix Inta, Pfi P. Z. & 1854, p 287, ad Mon. Hel 11, 1859,

59

p 38, Ro Conch Ic no 1380; Bs A M N. H (3) xin, 1864, p 497

Euplecta praeminens, Syles, Proc Mal Soc 111, 1898, p 71, pl 5, figs 5, 6, Godwin-Austin, Mol Ind 11, 1899, p 100, pl 86, figs 1-7 (anatomy)

Euplecta agasty & Bedd (subsp), Blf Proc Mal Soc 11, 1901, p 250, pl 25, fig 10

Shell perforate, turbinately depressed, sublenticular, thin, horny, tulvous, ornamented above with fine, oblique, costulate striction, bearing elongate granules airanged in closs spiral lines, smoother and more polished, but still decusately stricted, below, the spiral impressed lines disappearing near the umbilicus—spire low conoid, sometimes with concave sides, apex acute, sometimes prominently

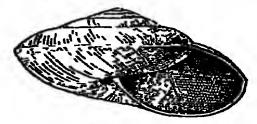


Fig 32 -Enplecta tratancorna

raised and papillar, suture impressed; whorls 6, regularly increasing, convex above, the last sharply keeled, not descending, swollen below, aperture oblique, roundly lunate, angulate at keel of last whorl; peristome thin, basal margin regularly curved, columellar briefly reflexed above.

Major diam 35, min 30, axis 20 mm

Hab Hills near Kottayam, Travancore (Kohlhoff, Beddome), Watawala, S W Ceylon (Collett), Iléwahetta, Hinidun (H Nevill)

The measurements are from an adult shell in Col Beddome's Collection. Benson's original type measured 29 mm in major diameter, but was not adult. This shell, now in the Cambridge Museum, had the keel white with the colour deeper on each side, a coloration found in a few specimens only

E præsminens from S.W Ceylon is a well-marked form with the apex prominent and papillar, and the sides of the spire consequently concave. The sculpture is a little weaker, especially beneath the last whorl. Other Ceylon specimens in my own and my brother's collection connect the two forms. The type of

E præemmens measured: major diam 281, axis 15 mm

[In a specimen from Watawala (O Collett) there is a minute right shell-lobe but no left shell-lobe. The right dorsal lobe is moderately large, the left in two distinct parts, the posterior long and narrow (fig 30 D, p 52). The law has a central projection on a strongly concave edge (fig 30 D). The teeth of the radula (fig 30 D) are arranged 54 1 21 1 21.1.54, or 76 1 76. The mucous pore is large, extending to the sole of the foot, which is undivided (fig 30 D).

Helia lota (Pfr P Z S 1854, p 287; id Mon. Hel iv. p 38, Rv Conch Ic no 1380), from an unknown locality, was identified by Benson (A. M N H (3) xm. 1864, p 497) with shells from the Anaimalai Hills. Judging by the figure in Reeve (the species is not mentioned in the 'Conchologia Indica') II lata must have been very similar to E. travancorica, and may have been identical, in which case the name lata has priority. The type has disappeared, but a specimen in Cambridge from Benson's Collection thus named is E ucuducta

A variety exists with the keel white as in E. albizonata It

is figured by Hanley, C I. pl 149, fig 7

E agastyæ is similar to E travancorica, but thinner, less sharply keeled, more swollen below, and more finely sculptured, with the lower surface less polished than that of E, travancorica

Major diam 34, min. 30, axis 22½ mm

Hab. Agastyamalaı near Cape Comoun, 4000 feet (Beddome).

88 Euplecta indica, Pf: (Helix) Symb in, 1846, p 66, id Mon Hel i, 1847, p 80, id t c vii, 1876, p 132, Ri Conch Ic no 448, H & T (Helix) C I 1876, pl 55, fig 10, Blf I A. S. B. 1866, 2, p 30, Nevill (Nanna), Hand-l 1, 1878, p 31

Helix oblita, Pf: P Z S 1851, p 263, id Mon. Hel in, 1853, p 54, id t c vii, 1876, p 100

Helix shiplayi, Pf: P Z S 1856, p 327, id Mon Hel iv, 1859, p 38, H & T C I 1876, pl 131, figs 7, 10, Godwin-Awsten, Mol Ind ii, 1898, p 102

Euplecta malabarica, subsp, Blf Proc Mal Soc iv, p 250, pl 25, fig 5, E A Smith, Faun Geog Mald Lac Is p 114

Shell perforate, subturbinate, lenticular, rather solid, isabelline to fulvous throughout, ornamented above with slightly arcuate costulation, decussated by impressed spiral lines, which are often obsolete, each rib bearing raised points or granules at subequal distances; spire coiled, with convex sides; whorls 5½-6, slowly



Fig 33 -Eupleela indica

increasing, convex, the last keeled, smooth beneath and radiately striated with a few concentric impressed lines below the keel, lower surface moderately swollen, aperture oblique, angularly lunate; peristome obtuse, white, columellar margin oblique, curved briefly reflexed above

Major diam 22, min 19, axis 12 min

[The animal of E shiplays has a very minute right shell-lobe, no left shell-lobe Left dorsal lobe similar to that of E preeminens Formula of radula 50 3 12 1 12.3 50, or 65 1.65 Lateral teeth bicuspid] Hab Nilgiri, Anaimalai, and Pulni Hills, the Wynard and Western Mysore as far north as the Kadur district, S Cauara, the lower country of Malabar (Nellumbur, Beypur), Travancore (Day); Ceylon (Beddome); N Mahlos Atoll, Maldives (Gardiner)

A common species on the Nilgiris from near the base to the top of the plateau, and both on the eastern and western sides; also common in places in Malabar. There is considerable variation in size and sculpture. Typical E indica is costulately stricted with distinct spiral impressed lines, and with very small granulation, whilst typical E shiplayi is smaller (20, 17, 12 mm), ligher in the spire, with stronger file-like sculpture. A large Nilgiri specimen measures in the three dimensions 27, 24, and 15 mm; a small variety from Beypore 15½, 14, and 9. The latter belongs to the form called E malabarica, and appears to inhabit the tract of country near the Malabur coast as far north as North Canara. This is found in the N. Mahlos Atoll, Maldives, doubtless introduced with plants

89 Euplecta albizonata, *Dohin* (Helix), *P Z S* 1858, p 133; *Pfr.* (Helix) *Mon Hel* v, 1868, p 90, *H & T* (Helix) *C I* 1876, pl 52, fig 6

Similar to the large variety of *E indica* in general form, but less sharply keeled and dull chestnut in colour, with, round the periphery, a narrow white bind, which is conspicuous inside the aperture; area round the umbilicus paler. The suture is deeper and the whorls above more convex.

Major diam 25, min 22, height 14 mm.

Hab. Ceylon (Thwaites), Travancore (Beddome).

A large Travancore specimen measures 29 mm. in major diameter; height 15 This form probably passes into E. indica

90 Euplecta emiliana, Pf: (Helix) P Z S 1852, p 83, td Mart \$\\$ Chemn Syst Conch -Cab ed 2, Helix, no 1075, pl 158, igs 33-35, td Mon Hel 11, 1853, p 55, Rv Conch Ic no 608, H \$\\$ T (Helix) C I 1876, pl 56, ig 10

Helix cingalensis, Bs A M N H (3) v, 1860, p 383, Pf: Mon Hel v, 1868, p 93, H \$\\$ T C I 1876, pl 54, igs 1, 2

Shell perforate, lenticular, fullous to isabelline, horny, translucent, closely and arcuately costulate above, the ribs bearing granular elevations separated from each other by impressed spiral



ling 34 -Euplecta emiliana.

lines, smooth and radiately striated beneath; spire conoid, apex varying, but generally acute, whoils 6, rather convex above, slowly and regularly increasing, the last not descending, sharply keeled,

convex beneath; aperture oblique, angularly lunate; peristome thin, upper margin arcuate, basal margin, seen from beneath, straight or slightly convex, columellar oblique, briefly reflexed above.

Major diam $16\frac{1}{2}$, min. 15, axis 9 mm

Hab Hills of South-western Ceylon, Matelle (Layard), Bala-

piti (Nevill), Ambagamua (Collett), Newara Ellia (F Layard)

This is the Cevlon representative of E indica, and, like that shell, varies in sculpture, in the sharpness of the keel, and in the height of the spire. As a rule, the present form is smaller and more closely wound than E indica, and it appears to be constantly distinguished by the peristome, the basal margin of which, viewed from beneath, is always concave in E indica, straight or even faintly convex in adults of E emiliana.

91. Euplecta lævis, Bif Proc Mal Soc 1v, 1901, p 257, pl 25, fig 8.

Shell obtectly perforate, depressedly turbinate, carinate, almost lenticular, whitish horny, translucent, the basal surface marked with fine, close, concentric, opaque white lines, smooth, minutely decussately striated above, radially striated beneath, spire conoid, suture impressed, whorls 6, convex above, the last sharply keeled at the periphery, convex below, aperture slightly oblique, angularly lunate; peristome thin, columellar margin vertical above, briefly triangularly reflexed, partly covering the perforation

Major diam. 17, min 15, axis 91 mm.

Hab Ceylon (Yerbury)

This shell is related to E emiliana, but is more sharply keeled, and differs in its smooth upper surface and in the milky concentric lines on the base.

92 Euplecta binoyaensis, Godwin-Austen, Mol Ind. ii, 1899, p 103, pl 97, figs 1-1 d (shell and anatomy), Blf Proc Mal Soc 11, 1901, p 250, pl 25, fig 7

Shell perforate, depressedly turbinate, carinate, fulvous horny, with the keel whitish, rather thin, finely, closely, and arcuately costulate above, the ribs bearing fine granules close together and arranged in spiral lines, spire conoid, whorls 5, convex above, slowly and regularly increasing, the last with a raised prominent keel, considerably swollen below the keel, smooth and radiately striated, aperture oblique, roundly lunate, angulate at the periphery, peristome simple, columellar margin oblique, slightly reflexed at the perforation

[Generative organs as in the genus. The muscular cacum (ap) is short. In this specimen a spermatophore in process of formation was seen and is noticeable as quite unlike those of the Macrochlamina (fig. 30 C, p. 52). It consists of a large elongate concident mass set on one side with minute spines at the base, these becoming in succession larger above; where the was deferens

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unites with the penis is the thin capsule also spined down the side, the spines being bilid and airanged in sets of two together.

The radula was similar to other species of the genus, arranged.

$$+40$$
 2.12 1.12 2 40+ $+54$.1 54+

Some of the outermost laterals not seen ?

Major diam 12, mm 10, axis 65 mm.

Hab Watawala, Ceylon (Collett)

Distinguished from E emiliana by fewer whorls, much more prominent keel, much rounder and higher mouth, and by the bodywhorl being considerably more turned beneath the keel

93 Euplecta verrucula, Pf1. (Helix) P Z S 1854, p 50, id Mon Hel iv 1859, p 40, id t c vii, 1876, p 105, H & T. (Helix) C I 1876, pl 150, hg 9, Blf Proc Mal Soc iv, 1901, p 251, pl 25, tig 6

Nigritella nerva, Jousseaume, Mém Soc Zool France, vii, 1894, p 275 (Sykes, Proc Mal Soc 111, 1898, p 65)

Shell perforate, turbinate, sharply keeled, thin, horny, translucent, finely costulate above, each rib bearing about 10 elongate granules, separated by equidistant impressed spiral lines, lower surface polished, ladiately striated, spire conoidal, apex acute; whorls 6. slightly convex above, the last with a sharp compressed keel, convex beneath; aperture slightly oblique, angularly lunate, peristome thin, basal and columellar margins curved, the latter reflected throughout, more broadly above

Major diam 14, min 13, axis 8 mm

Hab S W Ceylon (Thwaites), Uda Pussellawa, Watawala (Col-

lett), Fort McDonald (H Nevill)

This has a much higher spire than E emiliana, and there are fewer spiral impressed lines, about 10, on the last whorl. Pfeiffer's description was taken from half-grown shells, and these have been figured by Reeve and Hanley. The above description is from adults in Mr. E R Sykes s collection Specimens from Fort McDonald have a white keel.

94 Euplecta fluctuosa, Blf Proc Mal Soc 1v, 1901, p 251, fig 1

Shell subobtectly perforate, turbinate, carinate, pale horny, closely and finely ornamented throughout with flexuous transverse rows of granules arranged in spiral lines, the lower surface smooth, decussately structed, spine conoid, apex obtuse, suture impressed, whorls 5, -convex, the last compressedly keeled, convex below; aperture diagonal, approaching a thomb in form, margins converging slightly, peristome thin and in one plane, columellar margin triangularly reflected

Major diam 11½, min 10½, axis 7 mm Hab Gaisoppa Falls, North Canara

This shell is distinguished by its peculial flexuous and gianular sculpture, iew whorls, and diagonal aperture

95 Euplecta prestoni, Godwm-Austen, Proc Mal Soc n, 1897, p 177, pl 14, figs 1-1 e (part of anatomy and radula)

Shell perforate, subturbinate, keeled, thin, fulvous horny, closely ornamented with fine oblique filiform costulation above, the ribs bearing small granules, from which hair-like spines are developed at regular intervals; spire conoid, apex obtuse, suture impressed Whorls 5, closely wound, convex above, the last compressed below the keel at the periphery, convex, smooth, and polished beneath; aperture oblique, angularly lunate, columellar margin vertical above, reflected throughout, partly covering the perforation

[The dental formula is 28 10 1 10 28, or 38.1 38 The centre tooth is elongate, with cusps low down on either side; the admedian teeth with a large cusp on the outer side; the laterals bicuspid, the innermost the longest. The law has a central

projection]

Major diam 5 25, min 4 9, axis 4 mm Hab Ceylon, Uda Pussellawa (Preston)

The shell described is immature, and it is possible the fullgrown shell may be considerably larger. The spines can only be seen under a microscope

96 Euplecta scobinoides, Syles, Proc Mal Soc 11, 1897, p 234, pl 16, figs 1, 2

Shell perforate, lenticular, dark brownish horny, translucent, marked above with fine close arcuate filiforin striae, which are granularly decussated by spiral lines lying close together towards the outside of each whoil, further apart inside, [below smooth, with microscopic wavy, longitudinal striae], spire low, apex blunt, sutures slightly impressed; whorls 5, narrow, slowly increasing, plano-convex above, the last sharply keeled, compressed beneath the keel, convex, smooth, and polished on the lower surface; aperture slightly oblique, narrow, angularly lunate; peristome thin, basal margin arcuate, columellar oblique, slightly reflected

Major diam 83, min 8, axis 41 mm Hab Ceylon, Watawala (Collett)

[97 Euplecta gardeneri, Pfr (See above, p 40.)

The animal with the visceral sac black, probably very dark grey in life. Right dorsal lobe ample, the left in two distinct widely separated parts, the posterior long and narrow. A pointed lobe over the mucous gland. Sole of toot with no division; the peripodial margin narrow, the parallel grooves above wide apart. In the genitalia the penis is looped up for a considerable length by a strong muscle encircling the main penis-sheath. The cæcum of the retractor muscle is long and there is a shortish blunt kalc-sac. The spermatheca very small and sessile. Amatorial organ long and large. Jaw curved, with a very slight central projection.

65

Radula with the lateral teeth evenly bicuspid; formula:

Although the shell is so very different to typical species of the genus, both this radula with the generative organs are conformable, and not with the same characters of *Ariophanta*. I therefore have to transfer it from where Blanford placed it to its present position in *Euplecta*]

- C. Globosely conoid or depressed, with rounded periphery.
- 98 Euplecta subopaca, Pfr. (Helix) P Z S 1853, p. 125, id. Mon Hel iv, 1859, p 55, id t c vii, 1876, p 118 Helix corylus, Rv Conch Ic. Helix, no 1439, pl 204, H. & T. C I 1876, pl. 150, fig 8

Shell subobtertly perforate, convexly depressed, solid, rufous horny (varying from yellowish white to pale chestnut), having a silky lustre and fine arcuate costulation above, smooth, polished, and radiately striated beneath; spire low, convex to conoid. suture scarcely impressed; whorls 6, closely wound, flatly convex above.



Fig 35 — Euplocta subopaca

the last broader, rounded at the periphery, convex below, aperture oblique, lunate, peristome thin, basal margin straight when looked at from beneath, columellar oblique, regularly curved, slightly expanded, more broadly at the perforation.

Major diam 15, min. 13½, axis 9 mm

Hab Higher Hills of South-western Ceylon; Nuwara Eliya (G. Nevill); Pedro Talle Galle, 6000' (H F. B), Gampala (H Nevill).

99 Euplecta partata, Pf: (Helix) P Z S 1858, p 125, id (Helix)

Mon Hel iv, 1859, p. 55, id t c vii, 1876, pp 118, 532,

H & T (Helix) C I 1876, pl 85, figs 5, 6; Godwin-Austen,

Mol Ind ii, 1899, p 98, pl 87, figs 1—1 e (anatomy)

Helix maicida, Bs (nec Shuttleworth) A. M. N H (2) xii, 1853,

p 92

Helix subconoidea, Pf: P Z S 1854, p 51, id Mon Hel iv,

1859, p 56, id t c vii, 1876, pp 118, 532, H & T. C. I 1876,

p 36, pl 85, figs 7, 10

Shell subobtectly perforate, convexly depressed, rather thun, isabelline to yellowish horny, polished, strongly but rather irregularly transversely sugosely structed above, smooth with sadiating

66 Jonitida

striction beneath, spine low, apex obtuse whorls 6 convex, slowly increasing, the last rounded at the periphery, rather fiatly convex beneath, aperture slightly oblique, lunate; peristone thin, basal margin a little arcuate, columellar slightly expanded, more broadly near the perforation, which is partly covered.

Major diam $14\frac{1}{2}$, min 13, axis 7 mm

Hab South-western Ceylon; Rhambodde Matelle East (Newll, Layard), Bolegalle, near Kandy (H F B), Ratnapura, Gampola,

Nuwara Eliva (H Nevill) From Ambagamua (O Collett)

[The animal (fig 30 A, p 52) has the left dotsal lobe divided into a large anterior and a small elongate narrow posterior portion. The lower main sheath of the male organ is very short from the generative aperture upwards, it then diminishes in section and is tolded into a large loop confined by a strong broad muscle. Near the return portion of the free loop is a short stout portion, the diverticulum or excum, to which the retractor muscle is attached, near the same place is the short kale-sac which the vas deferens joins. A very remarkable set of finger-like processes occur here (fig. 30 A), marking the place of formation of the spermatophore of peculiar form (fig. 30 C). The radula formula is

72 1 13 1 . 13 1 . 72 86 . 1 86

The laterals are long, curved, and becusped, the outer cusp

considerably below the points of the inner]

There has been some confusion between this and E subopaca, and it is difficult to determine the types, though the original descriptions are perfectly clear E partita is a thinner, less globose shell than E subopaca, with less strong and less regular sculpture, and of a different colour. II. subconordea was founded on immature specimens of E partita

A variety with the spire almost or quite flat, and the last whorl subangulate above the periphery, occurs amongst specimens from

Ratnapura and Nuwara Eliya in Mr H Nevill's collection

100 Euplecta trimeni, Jousseaume (Euplectella), Mém Soc Zool France, vii, 1894, p 276, pl 4, fig 5

Shell narrowly perforate, conoidly depressed, thin, fragile, subpellucid, obliquely costulate above, radiately striated beneath, pale obvaceous fulvous; spire low, conoid, suture impressed, whorls 5½, slightly convex, the last depressedly rounded, scarcely descending; aperture oblique, lunate, peristome simple, straight, thin, sharp, columellar margin slightly thickened, reflected and appressed at the perforation, the margins joined by a thin callus

Major diam. 10, min 9, axis 7 mm Hab Nuwara Eliya, Ceylon

Judging from the above description, translated from the original, the single specimen to which the name was given may have been a small thin shell of E subopaca, perhaps immature

D. Conoidly depressed and carmate.

101 Eaplecta acuducta, Bs (Helix) A. M N H (2) v, 1850, p 214, Pfi (Helix) Mon Hel iu, 1853, p 78; id t. c iv, 1859, p 67, PH & T (Helix) C L 1876, pl 50, fig 5
Nanna koondaensis, Blf J A S B 1870, p 16, pl 3, fig 12,
H & T (Helix) C I 1876, pl 56, figs 5, 6, Pfi Helix (Nanna) Mon Hel vii, 1876, p 225; Nevill (Nanna), Hand-l 1, 1878, p 29

Namna subkoondaensis, Godwin-Austen (Nevill MS), Proc. Mal Soc 11, 1897, p 175 (no description)

Shell perforate, sublenticular to depressed, carinate, fulvous horny, finely stricted above and decussated by rather close spiral impressed lines, similarly marked, but smoother, below; spire very low, conoidal, suture very slightly impressed; whorls 5½, almost



Fig 36 — Euplecta acuducta

flat above, regularly increasing, the last sharply keeled, compressed beneath the keel, swollen below; aperture oblique, angularly lunate, peristome slightly obtuse, white inside, columellar margin curved, slightly reflected above

Major diam 25, min 21, axis 11 mm.

Hab. Nilgiris (Jeidon); Sispára Ghat, Kundah Hills (W. T. B.); Tinnevelly; Trevandrum (Theobald); Kadur district.

Mysore (Daly); Ceylon (G. Nevill, H. F. B).

The type of E acuducta, now in Cambridge, is immature, it only differs from E koondaensis in having rather flatter whorls and a sharper keel (both characters due partly to immaturity) and in having the last whorl slightly broader.

The shell from the Kadur district of Mysore is sharply keeled

and subcostulately striated

This species varies in height of spire, sharpness of keel, and sculpture, and some varieties approach E. indica, others E. travancorrea. E acuducta can be easily distinguished, as a rule, by the height of the spire being much less than the depth of the last whorl below the keel.

The animal figured under the present name J. A. S. B. 1882, 2p 69, pl 5. fig. 2, 18 probably, as 18 pointed out by Godwin-Austen

(7 c), wrongly identified

102 Euplecta isabellina, Pfr (Helix) P Z S 1854, pl 52, id Mon Hel ix, 1859, p 66, H & T (Helix) C I 1876, pl 27, fig 7 Helix isabella, H & T C I 1876, p viii; Nev (Nanina) Hand-l i, 1878, p 29

Shell perforate, depressed, sublenticular, thin, horny, translucent, straw-coloured to isabelline, strinted, the strice interrupted by impressed lines leaving elongate granules, which form subdistant spiral bands; spire convex, its height torning less than half the axis, apex distinct, suture linear, not impressed. Whorls 5-5], increasing regularly, flattened above, the last broader than in most allied forms, sharply keeled, not descending, swollen beneath, aperture oblique, angularly lunate, subrhomboidal, peristoine thin, basal margin regularly curved, columellar margin almost vertical above, briefly and broadly reflexed

Major diam. 33, min 27, axis 15 mm Hab. Hills of South-western Ceylon

103 Euplecta colletti, Syles, Proc Mal Soc 11, 1897, p 234, pl. 16, figs 5, 6.

Smaller than *E. isabellina*, but closely allied to it The whorls, 4½ to 5 in number, increase more slowly, and the last whorl is proportionally narrower; the spiral sculpture so conspicuous on *E isabellina* is almost obsolete or replaced by fine close spiral lines of granules, and the protocouch is smooth Colour tawny.

Major diam 21, min 17½, axis 8½ min Hab Watawala, Ceylon (Collett)

This may be immature, and may be a variety of E isabellina, but it is sufficiently distinct to require recognition

E Trochiform

n Sculpture granular

104 Euplecta cacuminifera, Bs (Helix) A M N H (2) v, 1850, p 214, Pfi Mon Hel in 1853, p 36, iv, 1859 vii, 1876, p 103, H & T C I 1876, pl 54, fig 2

Shell obtectly perforate, trochiform, thin, horny, with fine granular sculpture above, arranged on the oblique strike of growth in spiral longitudinal series, varying slightly and somewhat irregularly in size, some series or parts of series of granules being larger than others, spire conoidal with concave sides, apex attenuate, whorls 8, slowly increasing, flat above, the last acutely keeled, compressed below the keel, convex beneath, smooth, polished and radiately striated; aperture scarcely oblique, sharply angulate at the periphery; peristome thin, columellar margin oblique, triangularly reflected above, partly covering the perforation.

Major diam 18, min 16, axis 13 mm Hab. Nilgiri Hills, S India (Jerdon), Sispaia (W T B).

This shell is easily recognized by its sculpture

105 Euplecta granulifera, Blf Pioc Mal Soc iv, p 252, fig 5

Shell minutely and subobtectly perforate, subturbinately trochiform, thin, horny, ornamented above with numerous minute tubercles, close together, somewhat irregular in size, and airanged in both spiral and transverse series, smooth and finely striated radiately beneath; spire rather high, conical, apex obtuve, the apical whorls smooth, suture impressed, whoils 7, slowly increasing, convex, the last filiformly keeled at the periphery, moderately convex below, aperture nearly vertical, roundly lunate; peristome thin, the margins converging above, columellar nearly vertical, reflected throughout, more broadly above

Major diam 61, min 51, axis 51 mm

Hab. N. Canara (Beddome)

This small species is distinguished at once by its conical spire and peculiarly granular sculpture; the latter, in this and in E. cacuminifera, consisting, as seen under the microscope, of minute hemispherical tubercles arranged in series, but not based on 11bs as in E. indica, &c.

b Sculptus & finely decussated.

106 Euplecta hyphasma, Pf. (Helix) P.Z & 1853, p 124, id Mon. Hel iv, p 40, vii, p 105, H & T C I 1876, pl. 54, fig 3; [Godinn-Austen, Mol Ind ii 1907, p 186, pl 114, figs 1, 1 a (genitalia)]

Shell minutely and subobtectly perforate, trochiform, thin, whitish to brownish horny, minutely but regularly obliquely costulated, the ribs bearing very fine granulation, often difficult of detection; spire conical with straight sides, apex acute, suture





Fig 37 -Euplecta hyphasma.

unpressed, whorls 6½ to 7, convex above, the last sharply and compressedly keeled at the periphery, moderately convex, smooth, and polished beneath; aperture oblique, rhomboidally lunate; peristome thin, acute, columellar margin subvertical above, regularly curved below, reflected triangularly at the perforation and partly covering it.

In a spirit-specimen from Ambagamua the animal is pale coloured, the dorsal lobes black, with a patch of same colour on the sides of the neck and near the extremity of the foot, peripodial margin broad; the mantle-zone has no shell-lobes. Jaw

has a slight central projection

Radula with 81 lows of teeth, arranged .

48.1.10.1.10 1.48 59.1.59

The centre tricuspid, admedian with cusp on outer side; laterals

bicuspid, with points even

The male organ is a modified form of that of E binoguensis, the loop is not present, the muscular cæcum is longer, the amatorial organ is present, and the spermatophore is of the same type]

Major diam 13, min 12, axis $10\frac{1}{2}$ mm

Hab. South-western Ceylon; Kandy, 2000' (G Nevill, H F. B.), Saffragam (H. Nevill), Ambagamus (O. Collett).

107 Euplecta turritella, H Ad. Nanna (Rotula) P Z S 1869, p 275; H & T (Helix) C I 1876, p 36, pl 86, fig 4, Jouss Mém Sor Zool Fi vii, 1894, p 275
Nanna (Rotula) conulus, H Ad P Z S 1867, p 307, pl 19, fig 16, Pfr Mon Hel vii, 1876, p 69, nec Helix conulus, Martens, 1864

Very near E. hyphasma, but in typical shells the spire is higher, the sides meeting at a more acute angle, the sculpture is finer and the coloration different. The shell is whitish or brownish horny, except on the lower part of each whorl, where it is reddish, and on the last whoil there is a cliestnut band above and below the keel, which is itself white. According to Jousseaume, specimens occur with the keel also reddish, and some are chestnut-brown throughout

Major diam. 11, min 10, axis 9 mm. The height of the axis differs from Adams's measurements, but is taken from the shell

believed to be the type now in the British Museum

Hab Nuwara Eliya, Ceylon (Layard), Monaragalla to Rambodda (H. Nevell)

This form passes into E hyphasma.

c Smooth.

108. Euplecta? mucronifera, Blf Proc Mal Soc 1v, p 252, fig 3

Shell subobtectly perforate, trochiform, thin, milky white, the whorls irregularly streaked transversely and spirally with dusky horny, neighbourhood of mouth chestnut, covered with a thin epidermis above, greenish vellow and thicker beneath, smooth, scarcely striated; spire conoid with concave sides, apex prominent, very sharp, suture linear, not impressed, whorls 7½, flat above, the last sharply and compressedly keeled, moderately convex beneath, aperture oblique, securiform, dark chestnut inside, peristome thin, straight, columellar margin descending obliquely, briefly reflexed at the perforation

Major diam. 181. min. 16, axis 171 mm

Hab. Anaimalai Hills (Beddome).

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This species has the peculiar acuminate spire of E. cacuminifera, but is perfectly smooth.

109 Euplecta phidias, Thorp MS apud Hanley (Helix), II & T. C. I 1876, p 59, pl 149, fig 4 (no description)

Shell imperforate, trochiform, white with a thin yellowish decidnous epidermis, smooth, finely striated obliquely, with traces of obsolete decussating lines, spire conical with perfectly straight sides, sutures not impressed, whorls 6½, perfectly flat above, the last sharply keeled, but little convex beneath; aperture oblique, almost diagonal, subrhomboidal, peristome thin, columellar

margin sharply reflected above, covering the perforation

[A specimen from Kandy, collected by Mi. O. Collett, has a pale other-coloured foot with a dark patch on the side of the neck, the overhanging lobe at extremity of foot conspicuous. The peripodial margin very broad, paler than the rest of the body, the grooves above very close together. The left dorsal lobe a narrow strip, not divided into two lobes. In the genitalia the male organ has the distinct loop as in the larger species of the genus, and with a large amatorial organ.

Radula · centre and admedian teeth as usual, the laterals very numerous, long, curved, evenly bicuspid, becoming very minute

on the edge Arranged thus

Jaw very strongly arched, with no central projection]

Major diam. 181, min 16, axis 14 mm. Hab. Ceylon, Upper Uva (F. Layard).

Distinguished by its flat smooth surface and close perforation. The animal is unknown of the following three species and their generic position is doubtful.

110 Euplecta concavospira, Pfr. (Helix) P Z & 1853, p 124; id Mon Hel. 17, p 32, vii, p 96, H & T C I 1876, pl 86, fig. 1

Shell subperforate, trochiform, thin, whitish horny, with a slight deciduous yellowish epidermis, finely and obliquely striated and subobsoletely decussated; spire conical, apex acute, suture but little impressed; whorls 6½-7, plano-convex above, the last sharply and compressedly keeled, moderately convex around the perforation beneath; aperture slightly oblique, angularly lunate, peristome acute, columellar margin curved, briefly reflected above, nearly covering the perforation

Major diam 16, mm 111, axis 11 mm

Hab. Ceylon (Layard); Kandy (Simon), Gongala (H. Newill). There is very little if any concavity in the sides of the spire. In Hanley's figure a shell is represented with a narrow rufous band above the keel, and in the upper whorls above the suture.

111 Euplecta 2 apicata, Blf [Nanna (Trochomorpha)] J A S B. 1870, 2, p 16, pl 3, fig 13, Pfr Mon Hel vin, p 97, H § 7 C I 1876, pl 54, fig 5

This differs from *E concavospica* in having the whorls quite flat above and the suture not impressed, and in the almost complete absence of sculpture except slight transverse struction. The apex is slightly exserted and the sides of the spire faintly concave. The colour is horny, sometimes streaked with opaque white.

Major diam 14, min 13, axis 10 mm.

Hab. Nilgiri Hills, Coonoor, Neduwattana, and Avalanche

(W T B); Anaimalai (Beddome).

In some specimens the striction is more distinct, and there are traces of spiral sculpture on the upper whoils.

112 Euplecta? orbiates, Blf Proc Mal Soc 11, 1901, p 258, fig 4

Description Euplecta bifasciata, Nevill, Godwin-Austen, Proc Mal Soc. 11, 1897, p 176 (no description)

Shell imperforate, trochiform, thin, diaphanous, obliquely striated above, radiately and arcuately beneath, covered with a deciduous yellowish-fulvous epidermis, thickest below, beneath the epidermis whitish holmy, with, in some specimens, two rufous bands, one above, the other below the keel; spire conical, sides slightly concave, apex pointed, suture not impressed, whorls 7-7½, flat above, the last compressedly keeled, slightly convex towards the middle beneath, aperture oblique, subtetragonal, hatchet-shaped, peristome thin, columellar margin vertical above and briefly reflexed, covering the perforation

Major diam 14, min 13, axis 11 inm Hab Myhendra, Travancore (Beddome)

Distinguished from E appears by higher spine and imperforation. Nevill's MS, name is inappropriate, as the bands are not always present

113. Euplecta ² mucosa, H' & H Bif (Helix) J A & B. xxx, 1862, p 353, pl 1, fig 9, pl. 2, fig 3, If; (Helix) Mon Hel. 1, 1868, p 51, H & T (Helix) C. I 1876, pl 90, figs 5, 6, Ner Nama (Microcystas) Hand-l 1, 1878, p 36

Shell imperforate, depressedly turbinate, very thin, pale, and more or less yellowish horny, obliquely striated, decussated with microscopic spiral (longitudinal) impressed lines on some of the inner whorls; spire conoidal, apex subacute, suture impressed, whorls 5, moderately convex above, the last considerably broader, slightly compressed at the periphery, turnidly convex beneath, the depth beneath the periphery exceeding the height of the spire, aperture large, oblique, roundly lunate; peristome straight, thin, columellar margin much curved, vertical above and slightly reflected, completely closing the perforation

Major diam. 8, min 62, height 5 mm. A large shell measures

9½×8×6 mm

Hab. On the upper portion of the Nilgiris, Pylara, Coonoor Ghat, Seeghoor Ghat, &c., Pulneys (Fan bank teste Nevill).

EUPLECTA.

This shell is distinguished from E layards and E acalles by want of perforation and carmation and by simpler sculpture. It is also smaller.

[I have found in one of Dr W T Blanford's field note-books a very good figure and a long description of the animal of this species, which I give verbatim as it is so good, descriptions of this sort from life being really of more value than those of the shells

"H mucosa, W Blt. Nilgins—No linguiform processes to the mantle Mantle rather large Animal dull orange, mantle yellow Tentacles blackish, with a dark line from the base of each to the mantle The lobe over the mucous pore very large. Back not carnate Foot broadly margined by a single line Animal and mantle coarsely granulate throughout and with irregular dots of a darker colour on the spaces between the winkles and especially on the edges of the foot Animal very active'

This description is sufficient to enable anyone to recognize the

species and preserve the animal for dissection

Blanford placed it next to *E. pulchella*; but as there is considerable doubt whether it belongs to the genus *Euplecta*, I transfer it to the end among other doubtful species.]

[Confining comparison to the formula of the radula in the genus Euplecta and the sinistral and dextral forms of Asiophanta, marked differentiation is displayed in the far fewer teeth in the radula of the first, whereas in the last two divisions the number is much greater in the proportion of 28 45. In the sinistral and dextral species remarkable similarity is found showing a close relationship with each other and a more distant one with Euplecta differences (specific) being confined in Ariophanta more to the form of the teeth themselves. To elucidate this I have taken the number of the admedian teeth, including the one or two of transition form, of all the species now examined in.

I. The smistral Arrophanter

II. The dextral

III Euplceta

The mean of all these formulæ is interesting, showing how much more numerous the teeth are—that is, how much broader is the central band of teeth set on quadrangular plates—in Nos I & II than in No III, thus —

	Numb(1 of species examined	Total admedian teeth on one side only	Resulting formula	Total admedian teeth
I.	67	139	23.1.23	46
II	vide 11 names below	244	22 1.22	44
m.	12	152	14 1.14	28

I exclude from No I An iophanta lawipes, in which the number of the admedian teeth is so far less numerous than in any other species of the genus, being only 8 on each side of the central tooth, or 16 as compared with 23, and is thus abnormal. From No. III. Eupleria I also exclude E. præminens (subspecies of travancorica) and semidecussata, in which the radula formula is 22.1.22 and 21.1.21 respectively, and thus is like that of the destrorse section of Ariophanta, while their generative organs approach those of Euplecia. Both these species range to Pennsular India, and thus form a soit of link with the majority of the Ariophantine of that side. The generative organs in other species of Ariophanta and Euplecia show an interesting development of one towards the other.

Species included in the above Genera.

I cysis, immerita, interrupta, bajadera, intumescens, dalyi (cysis var.) = 6 species

II belangeri, histrialis, ceraria, solata, tranquebarica, madaraspatana, Pliqulata, ceylanica, juliuna = ganoma, basileus,

chenu: = 11 species

111. *layardı, pludias, sluplayı = ındıca?, partıta, prestonı, *subopaca, mysorensis, binoyasısıs, hyphasma, gardeneri, subdecussata, colletti. = 12 species]

Genus RATNADVIPIA.

Ratnadvipia, Godwin-Austen, Proc Mal Soc in, 1899 p. 253. id Mol Ind ii, 1899, p 93, Collinge, Jour Mal 1901, viii, p 64.

Type, R uradians, Pfr.

Range Ceylon

Shell Vitima-like, with few whorls, thin, not polished above,

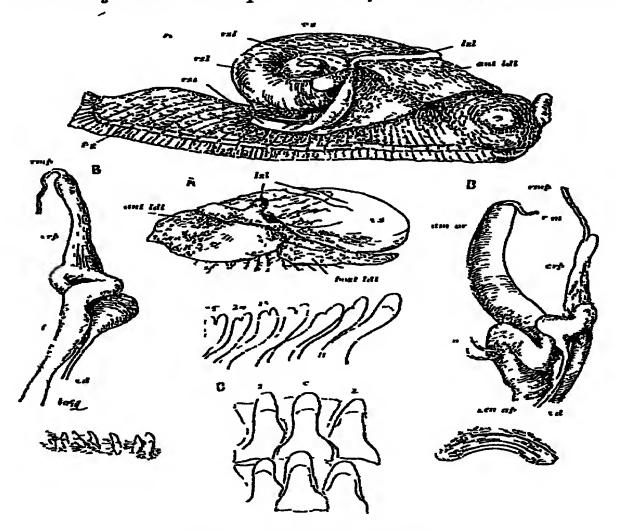
the outer whorl large

Animal large, much larger than the shell Mantle-edge large, surrounding the shell and partly covering it both the right and left shell-lobes produced posteriorly into tongue-like expansions, dorsal lobes greatly developed, the left dorsal lobe in two parts. The dorsain of the body just behind the shell is flat, but it is sharply keeled behind. Caudal extremity truncated, mucous pore large. Peripheral groove double. Sole with a median groove (not always conspicuous), but not divided into median and lateral tracts.

Radula broad, with numerous teeth in each row, the formula is 204.28.1 23 204 (227.1 227) The median band of large teeth is very broad, the teeth composing it are simple without lateral cusps, the numerous lalerals are bicuspid, except the outer marginals. Jaw with a concave edge without median projection

^{*} According to Semper

An amatorial organ (dart-sac) present, large and cylindrical; no calcareous dart found, but a short blunt muscular papilla. Spermatheca sessile The vas deferens passes into a kalc-sac, which is joined to the penis-sheath, some distance from the



[Fig 38 — Natnadvipia erradian-

A Animal from right side, showing the shell- and dorsal lobes, also part of, from the left side. The shell-lobes are cuiled up in the spirit-specimen, the dotted line on visceral sac indicates their extension in life. ×19

B Part of generalia showing the typical male organ of Arrophanta. ×34

C Jan and teeth of the radula ×268.]

retractor muscle, by an epiphallus; cacum of penis straight, as in Ariophania

This genus differs from Indiella chiefly in the possession of shell-lobes to the mantle, and in the absence of lateral cusps to the teeth of the median band in the radula.

114. Ratnadvipia irradians, Pf. (Vitrina) P Z S 1852, p 156, id (Vitrina) Mon Hel 111, 1853, p 3, id t c vii, 1876, p 14. H & T (Vitrina) C I 1876, p 29, pl 66, figs 8, 9, Godwin-Austen, Mol Ind 11, 1898, p 93, pl 85, figs 1-8 (animal & anatomy), Collinge, Jour Mal viii, 1991, p 65, pls. 5, 6 (anatomy)

Shell imperforate or subperforate, depressed, thin, diaphanous, dull blownish horny above, striated and decussated with rather uneven impressed lines, rather paler, smooth, and polished beneath, spire scarcely raised, suture impressed, whorls 4, flattened above,

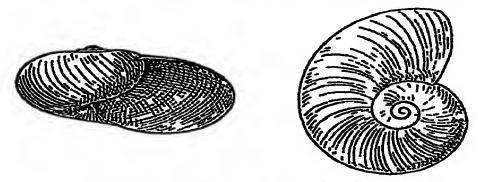


Fig 39 —Ralnadvipia viadians

rapidly increasing, the last much broader than the others, rounded at the periphery, convex beneath, aperture large, very oblique, lunately oval; peristome simple, thin, the upper margin arcuate, columellar margin regularly curved, briefly reflected close to the junction with the body-whorl

Major diam 24, min 19, axis 11 mm

Hab South-western Ceylon, Kandy (Collett), Peradeniya (Free-man) There are specimens in the British Museum said to be from Southern India, but the locality is regarded as very doubtful

115 Ratnadvipia ² edgariana, Bs (Vitrina) A M N H (2) xn, 1853, p 93, Pf; (Vitrina) Mon Hel iv, 1859, p 792, Nev (Helicarion) Hand-l i, 1878, p 15

"Shell much depressed, very thin, membranaceous beneath, highly polished, pellucid, striated obsoletely and obliquely above, ornamented by a few impressed spiral lines, yellowish horny spire rather flat, apex prominent, suture impressed; whorls 3, rapidly increasing, somewhat flat, the last very convex at the periphery, aperture oblique, ovately lunate

"Major diam 10, minor 8, height 4 mm" (Benson, in Latin)

Hab At Colombo, Hangwelle, and Ratnapura in the island of

Ceylon

It is very difficult to form any idea of the affinities of the present species. The presence of spiral impressed lines may indicate a relationship with *It in advans*. Unfortunately no specimens are available for examination.

[Ova of Anophanta læmpes, Mull (vide p 29)

"Citron-yellow in colour, quite soft, enclosed in a skin, which is slightly loose like a bladder $\frac{3}{4}$ filled, having a tendency to assume the form of a prolate spheroid with deep furrows running from end to end throughout Length about 5-6 mm., diam. 4-41 Probably all Ariophantas have similar ova "—Extract from Dr. W. T. Blunford's Note-book.]

Subfamily MACROCHLAMYINÆ.

Macrochlamynne, Godwin-Austen, Mol Ind 1, 1888, p 253, 11, 1907, p 170

Shells of very varied form; shell-lobes present in some genera, the free occum near the retractor muscle of the penis the principal distinguishing character, this being, in most cases, more or less closely wound. Amatorial organ in some species absent These are given subgeneric rank.]

Genus MACROCHLAMYS.

Macrochlamys Benson, J A S B i, 1832, pp 13, 76, v, 1836, p 350 (no description), Giay, P Z S 1847, p 169, Stoliczka, J A. S B \, 2, 1871, p 246, Nevill, J A S B 1, 2, 1881, p 131, Godinin-Austen, Mol Ind 1, 1883-88, pp 76-92, 97-122, 209-215, id t c 11, 1899, 1907, pp 87-90, 136-137, 151-170

Nanna, Giay, partim, P Z S 1834, p 58, Benson, t c p 89, id Zool Journ v, 1835, p 458, Nevill, J A S B 1, 2, 1881, p 131, nec Risso

Tanychlamys, Benson, P Z S 1834, p 89.

"Orobia," Albers, Heliceen, ed 2, 1860, p 57.

Type, M petrosa, Hutton

Range South-eastern Asia, including the whole Indian Empire

except the dry regions of North-western India.

Shell heliciform, perforate (rarely imperforate), depressed, sometimes subglobose or subturbinate, thin, horny, as a rule smooth and polished, especially beneath, occasionally distinctly, often microscopically, striated or decussately sculptured; aperture lunate, peristone thin, but in a few species internally labiate,

columellar margin reflected at the perforation

Animal large and active, and in the wet season scarcely retractile within the shell. Foot narrow, the sole divided, by the arrangement of the muscles, into three parts, a median and two lateral areas, often distinguished by slight differences of colour. The mucous pore at the posterior extremity of the toot is large and overhung by a fleshy horn-like process, sometimes of considerable length; peripodial grooves well developed and double, the shallow grooves on the surface of the foot above the peripodial groove radiate from the shell, those on the back of the neck and back and

sides of the head forming a distinct tract. Lobes of the mantle well developed, the right and left shell-lobes both present, short or elongate and generally pointed, extending in some species nearly or quite to the apea of the shell, and constantly in motion.

[The left shell-lobe has been found absent in M atricoloi from

the Munipur Hills

In the genitalia, commencing at the generative aperture, the penis-sheath is a moderately long cylindrical tube (larger near the aperture) as tar as the sharp bend at the epiphallic portion; the tube continues thence to the retractor-muscle attachment, and so far it may be compared with the male organ of Arrophanta It is continuous still further, forming a closely-coiled cacum, the coil more or less conspicuous or becoming an indistinct muscular In three species from Sikkim the cæcum is long, free, and uncoiled, probably an early stage in its development retractor muscle attachment, in this case, is at the basal end of the cæcum, the epiphallus is short The kalc-sac is close to the junction with it of the vas deferens, and is either a long flagellum, a short diverticulum, or a blunt knob The dart-sac or amatorial organ is usually large, long, and cylindrical, the dart moscular spermatheca is elongate, more or less club-shaped, sometimes vith a bulbous termination, its shape is necessarily dependent on whether it is empty or containing one or more spermatophores]

The coiled cocum is replaced in M pedina &c by a simple diverticulum, to the end of which the retractor muscle is attached as in Ariophanta [This is a doubtful species of the genus]

Odontophore teeth of similar type to those of Ariophania. the rhachidian (central) teeth tricuspid; the admedians broad, 10-30 in number, about 100 to 160 in the row, bicuspid or partly (the inner teeth) tricuspid, the inner cusp disappearing on the outer teeth; outer laterals narrow and usually with two cusps throughout, either both terminal or one on the outside occasionally lower down [In some species the end of each lateral tooth is merely notched, in a few it is aculeate]

There has been considerable discussion as to the generic term Macrochlamys It was first published by Benson in 1832, and also a specific name M indica, but no description was given, and in 1834 it was replaced by Tanychlamys, also undescribed, said to be the same as Gray's Nanina In 1847 Gray adopted Macrochlamys, Benson, as a subgenus of Stenopus, Arrophanta and Nanina being other subgenera, and he named Helix vitrinoides as the type species of Macrochlamys The shell probably, and the molluse certainly, called Helix vitrinoides by Gray was an Indian species, and, as nearly as can be determined, M petrosa or M. perplana. According to the rules of nomenclature generally adopted, the term must be accepted as dating from Gray's quotation of it in 1847. The Orobia of Albers is identical, being also founded on the supposed H vitrinoides from India [which at that time included many different species in Bengal and even pedina of Bombay]

Mac ochlamys comprises many of the commonest Indian snails, and species abound in the damper parts of the country. The described forms are very numerous, and a great number are undescribed, but the differences in the shells are so small that in many cases the species cannot be readily distinguished by descriptions or even by figures. Several of those already described and named will very probably never be identified again. [The species are far better, even easily, distinguishable the one from the other by the animal, its external characters and internal anatomy. Owing to their many enemies and changes from excessive moisture to great dryness, it is difficult to find shells of mature size; on the other hand, the immature are abundant, and thus new species have in so many cases been created on them; but sooner or later the adult forms turn up.]

Because of the difficulty of recognizing the different forms, the species are here arranged according to locality. The microscopic sculpture, to which attention has been particularly directed by Lt.-Col Godwin-Austen, often affords a means of identification.

[In the Journ Asiat Soc Bengal, vol ni, p. 83 (Feb. 1832). Capt. Thos. Hutton describes the Mirzapur shell and gives a good description of the animal, which is recorded from low hills near Mirzapur, as H. petrosa, min, he mentions the 'two narrow, flat, gradually pointed filaments or tentacula, which, when the animal is in motion, are kept constantly playing over the surface of the shell' To Hutton, therefore, and not to Dr Gray, belongs the credit among English naturalists of having first described the animal of this genus and noted the great difference between the European and Asiatic forms of Helix as then constituted]

A Species from Himalayas west of Nepal

a Subglobose or subglobosely depressed, not lubiate

116 Macrochlamys vesicula, Bs (Hutton MS) (Nanna) J A S B. vii, 1838, p 216, p id (Helix) A M N H (2) ix, 1852, p 406, Hutton (Nanna), J A S B vi, 1837, p 931, Pf: Helix (Nanna) Mon Hel i, 1837, p 48, id t c ni, 1853, p 47, H & T (Helix) C. I 1876, pl 63, figs 5, 6, Nevill, Nanina (Macrochlamys), Hand-l i, 1878, p 25

Shell perforate, subglobosely depressed, thin, smooth, translucent. Attreous, pale, almost whitish horny; spire low, apex acuminate, suture impressed, whorls 6, convex above, the last larger, well-rounded at the periphery and tumid beneath; apeiture very slightly oblique, roundly lunate, about as high as broad; peristome very thin, in one plane, columellar margin much curved, vertical above and triangularly reflected at the perforation

[Hutton and Benson's original description should be referred to The shell to which this description applies, drawn up by Dr. Blanford, cannot now be picked out from among those under the name vesicula in his collection. It may have been made from the shells named vesicula at Cambridge, or in the Natural History Museum.]

Major diam 14, min. 122, height 7 min.

Hab Near Simla and Mussooree up to about 10,000 feet (Hutton); I have also specimens from Murree. According to Benson, various shells from the plains of India (Rájmahál &c.) belong to this form, and it was upon these specimens that his description of 1852 was founded, but the typical form described in 1838 was Himalayan and apparently from Simla Hutton also referred to Helia vencula shells found by him between Mhow and Neemuch These forms from the lowlands of Northern India require recomparison with the Himalayan type. The Nanna (Macrochlamys) vencula of Nevill's Hand-list, 1, p 25, from Rájmahál and Pareshnath, 12 probably, as suggested, M lecythis.

M. vesicula is distinguished from M. subjecta (p. 98) by its lower spire, smaller last whorl, and less broad aperture, and generally

by higher lustre and paler colour.

[It is possible vesicula of 1838 was M. glauca only the collection of a good series of shells of this type from the Simla and Mussoone Hills at different elevations can settle this point *]

117. Macrochlamys glauca, Bs MS., Pfr (Helix) Symb. 11, 1846, p 65, id (Helix-Nanina) Mon Hel 1, 1837, p 48, H & T. (Helix) C I 1876, pl 63, fig 10, Nevill (Nanina), Hand-L., 1878, p 25

Shell obtectly perforate or subperforate, conoidly subglobose, smooth, polished, whitish horny, spire low conoid, suture impressed, whorls 5½, convex, the last broader, rounded externally and beneath, aperture subvertical, roundly lunate, broader than high, peristome thin, in one plane, columellar margin vertical above and expanded, almost closing the perforation

Major diam 11½, min. 10, height 7 mm

Hab Western Himalayas; Almorah, Nami Tal; Mussooree, Kotgarh near Simla

A smaller shell than M vesicula, with a larger mouth and the

perforation nearly closed

[Specimen from Bhim Tal (N Annandale) — Shell major diam. 8 imm Animal very pale-coloured in spirit, with some fine mottling near the extremity of the foot. A small tongue-shaped right shell-lobe and very small left shell-lobe. The penis, which is only 1.54 mm. in length, shows the coiled cocum very distinctly. The radula is as usual, the laterals evenly bicuspid, the last 3 or 4 on the margin with a pectinate edge.

Formula 35 2 10.1.10 2.35.

The species has similar habits to those of Limaa

Mr Annandale, of the Indian Museum, Calcutta, writing to me from Bhim Tal, describes seeing one hanging by a thread of slime, about 15 feet long, proceeding from the posterior extremity of the toot?

* [See remarks at end of genus]

118. Macrochlamys nuda, Pf; (Helix) P Z S 1852, p 83, id Mart & Chenn Syst Conch - Cab ed 2, Helix, no 1102, pl 161, figs 16, 17, id (Helix) Mon Hel. 11, 1853, p 48, H & T (Helix) C I 1876, pl 31, figs 7, 10, Nevill, Hand-l 1, 1878, p 25

Shell scarcely perforate, depressedly subglobose, thin, smooth, translucent, pale fulvous horny; spire conoid, suture impressed: whorls 6, convex, the last broad, rounded at the periphery, inflated beneath; aperture nearly diagonal, roundly lunate, broader than high; peristome thin, margins converging, the right margin arcuate above, columellar curved, vertical above and rather broadly reflected

Major diam. 11, min 93, height 7 mm.

Hab Western Himalayas, Kumaun, Mussooree, Simla (Stoliczka,

teste Nevill)

The above description is chiefly taken from Pfeisfer, as no adult shell is available. This form only appears to differ from M gluncu in colour and in the obliquity of the mouth; if the latter character is due to age, as is probable, the two may be varieties of one species

119. Macrochlamys kuluensis, Blf. (Nevill, MS) P Z S 1904, 11, p 442, pl 25, fig 5

Shell openly perforate, subumbilicate, depressedly subglobose, thin, translucent, smooth, pale horny, spire conoidal, suture impressed, whorls 5½, convex, the last much larger, broadly rounded at the periphery and tumid beneath, aperture oblique, roundly lunate, about as broad as high; peristome thin, in one plane, columellar margin vertical and triangularly reflected above

Major diam. 12, min 10½, height 7 mm.

Hab Kulu

This is near M glauca and M. nuda, but distinguished by its much more open perforation and rounder mouth

- B. Species from Eastern Himalayas (Sikhim and Western Bhutan)
 - a Labrate.
- 120 Macrochlamys tugurium, Bs (Helix) A M N H (2) x, 1852, p 348, Pf; (Helix) Mon Hel in, 1853, p 636, id t c iv, 1859, p 124, H & T (Helix) C I 1876, pl 29, fig 10, Nev (Nanina) Hand-l 1, 1878, p 80, Godwin-Austen (Macrochlamys), J A & B 1882, 2, p 69, pl 5, fig 4; id (Macrochlamys) Mol Ind i, 1883, pl 19, fig 2 (shell and animal), pl 20, fig 3 (details), id t c ii, 1907, p 151, pl 104, figs 1-7.

Shell perforate, depressedly conoid, sublenticular, thin, fulvous horny, dull and closely striated above and more distantly rugate, decussated with very fine impressed spiral lines, smoother and polished beneath, spire depressedly conoid, suture scarcely impressed, whoils 6, flatish, regularly increasing, the last not descending, angulate at the periphery, convex beneath; aperture

oblique, broadly lunate, with rather broad white labintion inside; peristome in one plane, acute, columellar margin curved, slightly expanded, briefly reflected above



Fig 40 -Macrochlamys trgur cum.

Maj diam 21½, min 18½, height 12 mm

Hab. Sikhim, not rare about Darjiling, 4000'-7000'

[The first two or three whorls of the shell show hardly any sculpture, thence a very finely decussate surface gradually follows, becoming strong towards the aperture; under a high power the

cross-struction produces a close series of papillate dots

Description of the animal A specimen from Rissom Peak in the Daling District, east of the Teesta, which prior to 1864 formed part of the Bhutan State (4000 feet), is as follows —Ochie throughout, the pedal margin very wide, sole of foot divided into three equal areas, a very large overhanging lobe at the extremity of the foot There is a large right shell-lobe and a well-developed left shell-lobe, the right neck-lobe is small, the left neck-lobe rather narrow and succeeded after a short interval by apother very small lobe close up to the left shell-lobe The roof of the respiratory cavity is mottled spaisely with black. In a full-grown specimen from the same locality the colour was ochraceous, the peripodial fringe and sole of the foot with a green tinge. When the shell is removed a broad black band is conspicuous near the rectum, the membrane of the visceral sac covering the branchial cavity is speckled and streaked all over, and one large longitudinal streak occurs on about the middle line, while the integument covering the renal organ is black, forming a second, more posterior, brownish streak There is a long pointed lobe over the mucous The right shell-lobe is large and tapering, the left is well developed, the dorsal lobes as before described

The generative organs were not found at their full state of development. the animals were taken in the winter months, still there was quite sufficient to show all the important characters. In the male organ the retractor muscle is attached to a coiled cocum and there is a moderately long flagellum. The amatorial

organ's very long, also the spermatheca

The jaw has a central projection

The teeth of the radula are as is usual in the genus Macochlamys as regards the centre tooth and admedians, the arrangement being as follows —

The teeth from the 15th to the 18th inclusive have a cusp on the

outer side below the point, this cusp becomes rapidly very minute, and towards the margin the teeth are nearly aculeate, only a very minute notch indicating the cusp]

121. Maciochlamys mainwaringi, Godwin-Austen (G. Nevill, MS. Bensonia⁹), J. A. S. B. 1882, p. 69, pl. 5, ng. 3 (animal), Blf Proc. Mal. Soc. 1v, 1901, p. 182
Helix celox, Theobald (Bs. MS.), J. A. S. B. XXII, 1863, p. 365 (no description).

Shell perforate, subturbinately depressed, pale fulvous, thin, horny, translucent, dull and not polished above, striated obliquely and minutely decussated with spiral impressed lines, which disappear on decortated shells, smoother and polished beneath; spire depressedly conical, suture slightly impressed; whorls 6-7, regularly increasing, the last rounded at the periphery; aperture moderately oblique, broad, lunate, peristoine sharp, with a white labiation inside, similar labiation, marked by white bands, often found in the last whorls, marking the position of peristomes formed during growth

Major diam 27, min 235, height 155 mm

Hab Sikhim Darjiling, about 7000'; Kursiong.

Immature individuals often have a thin portion of the last whorl extending beyond the labiate peristome, which has evidently

been formed during a period of rest, probably the winter

The animal, as shown in Stoliczka's drawing figured by Godwin-Austen, is dull brick-red in colour, with a well-marked horn-like projection above the mucous pore. No shell-lobes are shown, but this may be due to their being small and inconspicuous. At the same time the lobes may be wanting, in which case this species should probably be referred to *Bensouia*

122 Macrochlamys dalingensis, Godwm-Austen, Mol Ind i, 1883, p 121, pl 35, figs 1-10 (shell and anatomy), Blf Proc Mal Soc. iv, 1901, p 180

Very similar to M. mainwarings, but thinner, darker, and with the last whorl less turned beneath the periphery, consequently the aperture is not so high, the sculpture too is rather stronger, consisting of fine, close, almost subcostulate stries, decussated by fine impressed lines; the stries nodose or papillate under the microscope between the intersections. The labilation inside the aperture appears to vary and is occasionally wanting.

Major diam. 24, min. 21, axis 125? mm.

Hab. Damsang, Daling Hills, Bhutan Duars, about 6000':

Sikhim, Singtam, about 5000'.

Animal pale-coloured (in spirits); shell-lobes both present, but not large Radula normal, formula 45.2.14.1.14.2.45; marginals almost simple, becoming unevenly bicuspid as they approach the admedian teeth. [In the generative organs the coiled cocum is well seen, the epiphallus meeting the head of the penis close to and on side of it]

84

123. Macrochlamys opipara, Godwin-Austen, Mol. Ind. 1. 1883, p 108, pl 23, fig. 6.

Shell perforate, subglobosely depressed, less thin than most species of the genus, smooth and polished above and below, but with minute fine and close, shallow, longitudinal, impressed lines throughout, yellowish chestnut (horny in young specimens), spire low, conoidal, suture slightly impressed; whorls 6, convex, the last considerably broader, rounded at the periphery, moderately turned beneath, aperture slightly oblique, roundly lunate; peristome thin, straight, with a distinct thickening a short distance inside the lip, columellar margin curved, oblique, reflected above, partly closing the perforation.

Major diam 26½, mm 24, height 15 mm.

A smaller specimen measures $17 \times 14\frac{1}{2} \times 12\frac{1}{2}$.

Hab Sikhim Kursiong, 4000', Darjiling, 7000'; Tongliu, 10,000'.

Apparently not common The sdult form is one of the handsomest shells in the genus Immature specimens have long been known and were regarded by Benson as a variety of M. lubrica

[124. Macrochlamys damsangensis, Godum-Austen, Mol Ind 11, 1907, p 155, pl 105, figs 2-2 f

Shell depressedly globose, scarcely perforate, glassy, sculpture indistinct irregular longitudinal strim, but quite smooth in places, colour rich sienna-brown, pinkish inside the aperture spire depressed, suture shallow, whorls 4 (not quite fully grown), rather turned and rapidly increasing, aperture subvertical, ovate, the peristome on outer margin nearly the curve of a true circle. Columellar margin weak, subvertical, scarcely reflected

Size maj. diam 185, min diam 147, alt axis 64, alt body-

whorl 68 mm.

Hab. Damsang Peak, Daling District, Bhutan Duars

Animal Has the typical shell-lobes of Macrochlamys specimen dissected was much contracted and hardened by the alcohol, so that the mucous gland and lobe above both appear small. The sole of the foot is strongly divided into middle and The peripodial groove is conspicuous and the lateral areas. The membrane covering the pulmonary cavity is margin broad of a dark green colour, closely speckled, and above the renal organ and heart is quite black. The specimens were evidently taken in the cold season, for the generative organs were found to be exceedingly small and contracted and in trying to get them out were broken, yet sufficient was seen to show there was an amatorial organ and the general form of the penis This shows a long kalceac or flagellum and a convolution where the retractor muscle is given off; it therefore agrees with the typical form of the cacum in this genus, although its general form must be much altered and swollen during the season of reproduction.

The jaw has a central projection. The radula formula is

25.1.18.1.18 1 25 = 44.1.44

The central tooth is rather narrow, long, tricuspid; the admedian also on narrow plates, with one side cusp; the outer teeth are unevenly bicuspid. The breadth of the central portion is far

greater than that of both the marginal parts.

This species, as regards its shell, may at a casual glance very easily be mistaken for M. richilaensis; it is, however, a much stronger shell and not so globose. The animals are very differently coloured, particularly in the distribution of colour; and there is great diversity in the generative organs?

b. Not labrate.

a' Subturbinate

125 Macrochlamys hodgsoni, Bs (Blf. MS, Helm) A M N H (3) 111, 1859, p 267, Pfr (Helm) Mon Helm, 1868, p 110, H & T. (Helm) C I 1876; pl 31, figs 2, 3, Nevill, Nanina (Microcystis), Hand-l 1, 1878, p 38, [Godwin-Austen, Mol Ind in, 1907, p 159, pl 109, figs 1, 1 a (typical), 2-2 d]

Shell narrowly perforate, depressedly subglobose, thin, smooth, dull, very finely and closely decussated under the microscope with transverse and flexuous longitudinal striation, pale yellowish horny; spire conoidal, apex obtuse, suture impressed whorls 5, convex, the last rather broader, rounded but very slightly compressed at the periphery, convex beneath; aperture slightly oblique, rather roundly lunate, broader than high; peristome thin, columellar margin much curved, vertical above, rather broadly triangularly reflected.

Major diam 7, min 6, height 41 mm

Hab Sikhim, at low elevations; Pankabari, 1000'; [hills east

of Teesta up to 10,000']

[From the Richila Peak I have a large number, some very fine, with the same distinguishing sculpture. The largest measures 8 mm in major diameter; and these fresh specimens are all of a brown-umber colour, with a slight green tint. I found only very young specimens preserved in spirit. Right and left shell-lobes are present, the last large. Extremity of foot with a long lobe. Visceral sac with 4 transverse narrow black streaks. Jaw with a central projection; in the radula the central and admedians are narrow and long, one cusp on outer margin; laterals bicuspid and even. Formula

The teeth of the radula are of the same form, the formula differing slightly + 20.2 10.1 10 2 20 +

The jaw has a nearly straight edge with a slight central

projection, and differs from sequent from Daryling.]

[Macrochlamys sequius, Godwin-Austen (very young), Mol Ind 11, 1997, p 168, pl 109, fig 7

Shell depressedly conoid, umbilicated, glassy, rather solid, sculpture fine, but distinct and regular longitudinal strim, colour pale sienna-brown, spire flatly conoid, sature shallow, whorks nearly 4, the last well rounded, aperture ovately lunate, subvertical, peristome slightly thickened, columellar margin very slightly reflected

Size major diam 50, alt axis 19 mm Locality Darphing (ex Coll. Calcutta Museum).]

128. Maciochlamys superflua. Bif P Z S 1904, n, p 442, pl 25, fig 7 [Godwn-Austen, Mal Ind n, 1907, p 162, pl 109, fig 6 (n very young shell)]

Sliell perforate, depressed, thin, polished, uncroscopically marked with faint, subdistant, longitudinal (spiral), impressed lines above and often below, the spaces between the lines papillate, pale yellowish to brownish horny spire low, suture well impressed,

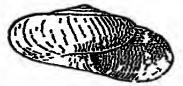


Fig 41 -Macrochlomys superfluo

whoils 6, in ther rapidly increasing, the last broader, rounded at the periphery and convex beneath, aperture slightly oblique, sub-ovately lunate, broader than high, peristome thin, basal margin almost straight when viewed from below, columellar vertical above, their obliquely curved, rather broadly reflected at the perforation

Major diam 20, min 171, height 10 min.

Hab Sikhim Common in the Upper Teesta Valley about Sing-

tam (4000-5000').

This somewhat resembles M sequar, but is distinguished by larger size and different sculpture. It is also very much like immature shells of M. lubica, but may be known by the presence of longitudinal sculptine, more numerous whorls, colour, &c.

[129 Macrochlam s rakaensis, Godwin-Austen, Mol Ind 11, 1907, p. 164, pl 110, figs 2-2b

Shell subdepressedly globose, very narrowly perforate; sculpture

well marked, fine, regular, longitudinal striation, showing even on the lower side; it is a far stronger striation than is seen in *M sathrlaensis*, colour pale ashy brown, spire flatly conoid; suture impressed. Whorls 5, not fully grown, aperture widely lunate, subvertical; peristome very thin; columellar margin subvertical, with slight reflection.

Size may diam 90, alt axis 31 mm.

The coil of the spine differs from that of M sathilaensis

Locality Richila Peak, Bhutan frontier.

Animal. Pale-coloured throughout, with black head and the extremity of the foot tinged very slightly darker towards the tip of the overhanging lobe. Both the shell-lobes are very long, particularly the right, longer than in any spirit-specimen I have ever handled. The right dorsal lobe is small, the left in two parts. The lobe over the mucous gland is not very pointed. The visceral sac is umber-brown, sparsely mottled in front with black, and a long black streak next the renal organ.

Generative organs. The coiled excum is exactly like that of the typical species. The hale-sac is long. The spermatheca long. The radula is like that of allied species in every way (only the central tooth and admedians seen): + .2.10 1.10.2 +]

b2 Smooth

130. Macrochlamys lubrica, *Bs* (Helix) *A M N H* (2) x, 1852, p 349, *Pf*; (Helix) *Mon Hel* in, 1853, p 629, *id* t c ix, 1868, p 44, *H & T*. (Helix) *C I* 1876, pl 51, figs 8, 9, *Godwin-Austen*, *Mol Ind* 1, 1883, p 118, pl 24, fig 7

Shell perforate, depressed, smooth, polished, obsoletely striated, moderately thin, vellowish to brownish tawny, spire very low, sometimes almost flat, suture slightly impressed, whorls 5, convex above, the last rather broad, rounded at the periphery, moderately convex beneath, aperture broadly lunate, almost vertical; peristome acute, straight, basal portion sometimes slightly thickens and white inside, columellar margin curved, slightly reflected above.

Major diam. 26, min 21, height 12 mm

Hab. Sikhim, 4000-7000'. Not raie about Darjiling.

This shell may be known by its smoothness, its few whorls, and its broad last whorl The animal has not been described

- 2. Conoidly depressed, rugose, transverse (but no longitudinal) sculpture
- 131. Maciochlamys patane, Bs (IIelix) A M N H (3) ni, 1859, p 270, Pfi (Helix) Mon Hel v, 1868, p 113, H & T. (Helix) C I 1876, pl 130, figs 5, 6, 7, Godwin-Austen, Mol. Ind 1, 1888, p 211, pl 53, fig 5 (shell)

Shell perforate, conoidly depressed, thin, pale horny or ochreous horny, translucent, dull and rugosely striated across the whorls

90 ZONITIDÆ.

above, smooth and polished beneath, without longitudinal (spiral) sculpture, spire conoidal, apex blunt, suture impressed; whorl 6, convex, rather closely wound, the last rounded at the periphery, convex beneath, aperture oblique, rather roundly lunate, broader than high, peristome thin, columellar margin oblique, rather broadly reflected at the perforation

Major diam 10, min 9, height 6 mm

Hab Darnling.

Distinguished by its shape, rather narrow whoils, and rugose striction

[132 Macrochlamys ² perfiagilis, Godww-Austen (Newll, MS), Mol Ind n, 1907, p 161, pl 109, hg 5. Nauma (Microcystis), n sp 5 (Sikhim, coll D) F Stoliczka), Newll's Hand-list, no 167, p 39

Shell globose, scarcely perforate, thin membranaceous character, sculpture very minute, fine regular longitudinal striæ; colour sapphire-green, spire low, apex rounded and blunt, suture very shallow, whorls 4½, rounded on side, flat above; aperture broadly lunate, vertical, peristome very thin, columellar margin scarcely thickened, subvertical

Size maj diam 70, min 60, alt. axis 3.8 mm

Locality Sikhim

This shell was sent as 167 A, as the type of *perfragilis* There should be four specimens left in the Calcutta Museum]

c With a free cacum to male organ.

[133 Macrochlamys richilaensis, Godwin-Austen, Mol. Ind. 11, 1907, p 154, pl 105, figs 1-1 g.

Shell subdepressedly globose, very narrowly perforate, glassy surface, very transparent, sculpture none, transversely crossed by regular shallow close furrows; colour greenish ochre; spire depressed, suture shallow, whorls 4, rather rapidly increasing, showing at intervals 3 varices of progressional growth, aperture subvertical, widely lunate, columellar margin subvertical, not thickened and scarcely reflected. The aperture was covered with a thick membranaceous epiphragm.

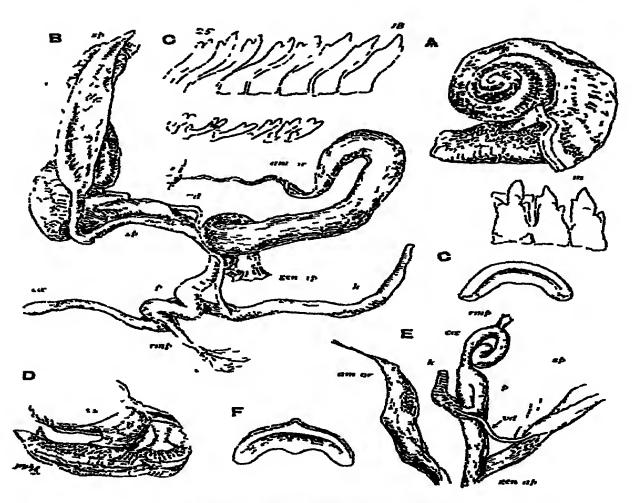
Locality Richila Pass, Bhutan frontier (10,370 it) Size: maj diam 1875, min 1475, alt axis 85 mm.

The animal is dark green near the extremity of the foot. The margin as well as the sole of the foot is pale other in the spirit, probably ruddy other in life, quite a contrast to the upper part. Sole of foot divided. As regards the general form, mucous gland, and neck-lobes it is very like M datagensis. The apical whorls of the visceral sac are black, sparsely speckled with other where the membrane covering the heart and kidney commences this colouring is reversed, the ground is pale openly speckled over with ovate black markings and dots, with an undefined band of

same colour near the mantle-zone A loop of the intestine is defined in black.

The jaw has no central projection.

The radula is nearly the same as in Dalingia bhutanensis, only that the marginal teeth are much more evenly bicuspid.



[Fig 42.—Macrochlamys ruhilacness

- A. Animalifrom spirit-specimen, shell removed, showing the right shell-lobe, &c × 2
- B Generative organs ×34
- C Jaw, × 12, and teeth of radula at different parts of the row, × 276

Macrochlamys zemoen-is

- D Animal from a spirit-specimen, seen from the right side, shell removed × 34
- F Genitalia, incomplete, annatorial organ detaclied × 9
 F Jan × 1657

The generative organs present very remarkable variation from typical Macrochlamys, particularly in the form of the penis. The kalc-sac is very long, quite a flagellum, and close to where the retractor muscle is given off there is a long free execum loosely coiled; this undoubtedly represents the closely-wound execum in the type species, to the side of which the retractor muscle is usually attached. In this species the execum is quite free, the retractor muscle rising at the base of the execum itself. The spermatheca is also very long and abnormal in form, consisting of a capacious thin-walled sac at the extremity of a thick muscular stalk-like tube, equal in length to the sac it terminates in. The amatorial organ is thick and large, with a very strong lengthened retractor muscle.

Here comparison must be made with the generative organs of M sathilaensis and M. zamoensis. In both species the penis presents a similar departure from that of typical M. indica, in both the penis cæciim is free and loosely coiled, merely kept together by a few muscular fibres, whereas in M. indica this cæciim is closely coiled into a mass impossible to unroll, and this is the

dominant type over an extensive area of country.

[134 Macrochlamys sathilaensis, Godwin-Austen, Mol Ind n, 1907, p 169, pl 106, figs 4-4 c (shell and anatomy)

Shell globosely conoid, translucent, delicate structure, narrowly umbilicated; sculpture confined to some very delicate fine longitudinal striation near the suture, which dies out, and the rest is perfectly smooth, crossed transversely by wavy furrows, colour pale ochraceous, spire moderately high, conoid, suture moderately deep, whorls 6, gradually increasing, aperture widely lunate, oblique; peristome very seldom quite perfect

Size maj diam 135, min 120, alt axis 65 mm

Locality Richila Peak, Bhutan frontier

This shell, which has very much the coloration of M sequer, differs altogether in form It belongs to a group very similar one

to the other, very common, and very variable with locality

Animal Colour throughout pale; no markings, only a slight grey tinge near the head. The withdrawn tentacles are very black, and in life probably show as dark lines on the neck; pallial margin finely streaked. The shell-lobes and extremity of foot as in M sequins from Damsang, and the radula is of the same type exactly.

The smaller teeth near the margin would add another 10 or 15 to the above, or about 90 m the row.

The jaw is well arched, with a large central projection

The visceral sac as closely mottled, and shows dark inside the shell.

The pens is quite different from that of sequax; the cacum, instead of being closely coiled, is free, similar in size and length to the kalc-sac, the epiphallus is very short, and just below the retractor muscle there is a globose enlargement of the penis-tube. The amatorial organ is long In the free cacum the male organ may be compared to the similar character found in M richilaensis.

This species was also obtained in the Risetchu Valley, and is represented by eight specimens, some of which are rather flatter in the spire than the type. Three specimens are from Rissom Peak.]

[135. Macrochlamys zemoensis, Godwin-Austen, Mol Ind 11, p. 164, 1907, pl. 100, figs 1-16 (shell, animal, and anatomy)

Shell globosely conoid, glassy, fragile, narrowly umbilicated; sculpture quite smooth; whorls transversely crossed by wavy furrows of growth, here and there traces of longitudinal striss under high power, colour ochraceous with an olive tint, some more sienna-brown than others, spire rather depressed, apex rounded; suture moderately impressed. Whorls 5, regularly increasing; aperture broadly lunate, peristome very thin, columellar margin weak, scarcely reflected

Size maj. diam 100, min 90; alt axis 45 mm

Locality Zemo Samdong, Sikhim, valley of the Lachen, about

12,000 feet In the pine-forests

Animal with a dark-coloured broad margin to the foot, pale on the keel of same, the pallial fringe broad; the lobe over the mucous gland long and pointed; sole of foot well divided. The right shell-lobe is large, rather broad at base. There is a small narrow left shell-lobe and the left dorsal lobe is in two separate parts. The visceral sac is sparsely spotted near the suture, with a black band bordering the mantle-zone, and a long black band runs parallel to the renal organ. The salivary glands are in one compact mass.

Genitalia. The penis-muscle is attached to a coiled free excum, as I have noticed in M richilaensis, there is a short flagellum where the vas deferens joins. The amatorial organ is moderately long

and straight

The jaw has a central projection.

The radula formula is

The centre tooth is tricuspid; the admedian teeth have a very small inner cusp high up on inside and a larger one lower down on the outside, the marginal teeth are bicuspid, the outer cusp below the main one.]

whorls 5½, slightly convex above, the last not descending, rounded at the periphery, moderately convex beneath, aperture slightly oblique, broadly lunate; peristome thin in one plane, the columellar maigin cuived, oblique, never quite vertical, carried forward and briefly reflected above

Major diam. 18½, min 16, height 8½ mm

Hab Lower Bengal, common at Calcutta This species is also said to be found in Sylhet to the castward and in Orissa to the south, other reported localities are more doubtful. I have seen shells closely resembling M indice from Karnul and from Ceylon,

but the sculpture is finer and indistinct

Animal purplish giey not black, elongate, "the right shell-lobe small, the left is narrowly reflected over the edge of the peristome, and at the basal side gives off a short tongue-like process"; right dorsal lobe narrow and elongate, the left in two distinct portions In the genitalia a moderately long cylindrical blunt kalc-sac is given off at the junction of the vas deferens, and the accum of the penis, to which the retractor muscle is attached, is sharply coiled. The dart-sac is long, the spermatheca short and elongately pearshaped. The radula contains about 88 lows of teeth, with the

arrangement 34.2.9 1.9 2.34 (45 1 45).

This species and M petiosa were for a long time identified with Helix viti inoides, Desh (Mag Zool 1831, p 26), a shell of unknown origin and described as imperforate The original figure given of H. vitrinoides has no great resemblance to either of the Indian species, but Benson's undescribed Macrochlamys indica, identified with the present form by some writers, appears to have been the same as Hutton's Nanma petrosa, though, as it was said to occur from Calcutta to Caunpoie, it may have comprised the Nevill's N pseudoviti moides was not present species also. described and was only identified as "the common smal" throughout the Gangetic Delta and distinct from N netrosa As more than one Mac ochlanys is common in the Gangetic Delta, it is uncertain to which Nevill's name belongs. The first complete description of the present species is that by Col Godwin-Austen, and his name M widica is accepted, although the shell is not the same as Benson's M undica, which was never described. No confusion with Emplecta indica, Pfr. (p 60), is possible, as that belongs to a distinct genus.

a' Longitudinal flavuous unpressed sculpture

139. Macrochlamys petrosa, Hutton (Helix?), J A S B 111, 1834, p 83, Pf. (Helix) Mon Hel 1, 1847, p 56, Bs (Helix) A M N II (2) 11, 1848, p 163, H & T. (Helix) C I 1876, pl 88, figs 7, 10, pp x111, 37, Nevill, Nanina (Macrochlamys), Hand-I 1, 1878, p 21, Godwn-Austen, Mol Ind 1, 1883, pp 96, 99, pl 19, figs 1, 1 a (animal), pl 21, fig 2 (sculpture), pl 22, fig 1 (shell)

Helix (Macrochlamys) undicus, Bs J A S B. i, 1832, p. 76, a

mere name, without description

Namma vitumoides, B. J. A. S. B. v., 1836, p. 350, Pfr. (Heliv)

Mon. Hel. 111, 1853, p. 62, pt.; id. t. c. vii, 1876, p. 108, pt. nec. Deskayes.

Shell very similar to that of M. indica, but broader in proportion to the height, the spire lower, and the lower surface more excavated around the perforation, which is larger The mouth is decidedly broader in proportion to its height; as a rule, too. the size is larger and the surface is more polished Longitudinal sculpture faint and often obsolete, when visible it resembles that of M. indica

Major diam 21, min. 18, height 9 mm

Hab The country south of the Gangetic plain from Raimahil to Bundelkhand, especially on hills at Raymabal, Patharghatta.

near Mirzapur, &c.

The animal is dark brown or blackish; both shell-lobes long and pointed; the lobe above the mucous gland very tapering and pointed.

b'. Very fine microscopic strice.

140. Macrochlamys hardwickii, Godwn-Austen, Mol. Ind 1, 1883. pp 105-107, pl 21, hg 10 (sculpture), pl 23, hgs 1-4 (shells), pl 28, hgs 1, 1 a, 1 b (anatomy)
Macrochlamys hardwickii, var politulus, Godicin-Austen, l. c.

Macrochlamys sylhetensis, Goduin-Austen, Mol Ind 1, 1883, p 94, pl 21, tig 9 (sculpture only, no description) [Vide fig 51 B, p 133 Genitalia and teeth of the radula]

Shell perforate, conoidly depressed to depressed, thin, tawny, with a rather dull, greasy lustre above, more polished beneath, very minutely and closely stricted longitudinally, the strice only visible under a microscope; spire low, conoidal, suture slightly impressed; whorls 6, convex, the last broader, rounded at periphery, convex beneath; aperture slightly oblique, roundly lunate, perstome thin, in one plane, columellar margin curved, vertical above, and rather broadly reflected at the perforation.

Major diam. 16, mm 14, height 9 mm

Hab. Lower Bengal, Sylhet, and Western Assam specimens were obtained in Calcutta. Shells from Upper Assam are, as a rule, rather larger and flatter and are more vitreous These form the var politula

The shell of M indica is not easily distinguished except by its coarser and much less close longitudinal sculpture; generally it is

rather larger and flatter.

The animal differs from that of M indica in several particulars The body and tentacles are pale grey, the mantle pale ochraceous The shell-lobes are smaller The spermatheca and kalc-sac are both considerably longer and the form of the penis is different The radula contains about 109 rows of teeth, airanged thus 50 1 12.1.12 1 50 (63 1.63).

b Smootk

141 Macrochlamys subjects, IIs (Helix) A M N II (2) 1x, 1852, p 407, Pfi (Helix) Mon Hel 111, 1853, p 48, II & T (Helix) C. I 1876, pl 64, figs 1, 2, 3, Nevill, Hand-l 1, 1878, p 25

Shell subobtectly perforate, considly depressed (subglobose), very thin, smooth, with a rather only lustre above, more vitreous beneath, pale yellowish amber to yellowish tawny in colour, spire low consider, apex rather acute, suture impressed, whork 6-61, convex above, the last considerably broader, well rounded externally and beneath; aperture slightly oblique, roundly lunate, broader than high, peristome very thin, in one plane, columellar margin much curved, becoming vertical near the perforation and triangularly expanded, but very little reflected

Major diam. 16, min. 13, height 9 mm.

Hab. Rajmahal Hills; Oiissa, Cutiack (Theobald, IV. T. B); Ganjam.

This species may be distinguished from its allies by its broader

last whorl and larger and broader mouth.

[Animal from spirit-specimen (Rajmahal) pale in colour, with slight coloration near the extremity of the foot, which has a hooked overhanging termination. The right shell-lobe is moderately long, tongue-shaped, and attenuate, the left is very small. the left dorsal in two parts, overlapping. The generative organs were not in the active stage and were very small. A coiled cacum is present in the penis, and the ainstorial organ was observed. Teeth of radula of usual form, laterals evenly bicuspid Formula 48 2 10 1.10 2 48, or 60.1.60.

Jaw arched, with a central projection]

142. Macrochlamys lecythis, B₈ (Helm) A M N H (2) m, 1853, p 406 Pfr. (Helm) Mon Helm, 1853, p 47, H & T. (Helm) C I 1876, pl. 63, figs 8, 9

Macrochiam's lecythis?, Godinin-Austen, Mol Ind 1, 1883, pl 19, fig 5 (animal), 11, 1809, p 184, pl 94, figs 2, 2a, 4 (spermatophore) [18 another species]

Shell subobtectly perforate, conoidly depressed (depressedly subglobose), thin, polished, smooth, ochraceous horny, sometimes olivaceous; spire conoid, slightly raised, suture deep; whorls 5-6, convex, the last much broader, rounded at the periphery, moderately swollen beneath, aperture oblique, elliptically lunate, decidedly broader than high, peristome thin, straight, columellar margin oblique, triangularly reflected above

"Major diam 14, min 13, height 8½ min." (Bs). An immature

shell measures $11\frac{1}{2} \times 10 \times 6\frac{1}{2}$ mm.

Hab Raymahal Hills (Bucon), Parasnath?

The typical form appears to pass into one with a rounder mouth and vertical columellar margin, Benson's M vesicula from Bengal The shells from Assam and the Assam Hills are much stouter than those from Western Bengal and may be a different species

M lecythus is known from M subjecta and M vesicula, Benson, 1852, by having the aperture distinctly wider, than high [I consider vesicula, Bs, 1852, = lecythis This and subjects are species so extremely close to one another that I doubt their distinctness. They cannot be matched with shells of this type from Assam and neighbouring hill-ranges ?

143 Macrochlamys perplana, Neull, MS, Godwin-Austen, Mol Ind 1, 1883, p 94 (no description), pl 19, fig 4 (animal from typical locality, Parasnath, copied from Stoliczka's drawings)

Maciochlamys jainiana, Godwin-Austen, Mol Ind 1, 1883, pp 111, 112, pl 26, figs, 7, 8 (shells), pl 28, figs 2-2 e (anatomy), 11, November 1899, p 134 (spermatophore)

Nanna vitrinoides, Strickland, P Z S 1848, p 142, Moll pl 2,

figs. 1, 2

Nanina (Macrochlamys) n sp., Nevill, Hand-l 1, 1878, p 22, no 28 [8 sp , Parasnath (type), coll Stoliczka with abridged description of animal taken from that by Stoliczka)

Macrochlamys stricklandi, Godwin-Austen, Mol Ind 1, 1883, p 82 (no description), pl 26, fig. 8 [This shell, from Jeypur, differs

much in form, and may prove to be distinct]

Similar to M indica, but more depressed and with the spire almost flat, the surface smooth, and the perforation larger; whorls 6, the last broader, aperture broadly lunate, columellar margin but little curved, oblique throughout, slightly expanded for some

distance, more so at the perforation.

[" Macrochlamys (Parisnath) — Shell of flattened form. mantle-lobes (i e. shell-lobes) very long and narrow, mantle greensh, splashed with white Whole body of a distinct greenish tinge, anterior part, especially on the pedicles and back, black. middle part pale; posterior part dark above, less dark at the sides" In Nevill's handwriting. ' N perplana, Nevill" (p 4, fig. 11, Drawings of Land Mollusca executed under the Superintendence of the late Ferd Stoliczka') Indian Museum Library]
Major diam 20 min 17, height 7½ mm.

Hab Upper part of Parasnath Hill in Western Bengal (W T. B., Stoliczka), Panchet Hill near Ranganj (W T B), Manbhum

(V. Ball), Madhopur, Jeypur (Capt A B. Melville)

Teeth in 1adula 27.15 1 15 27 (42.1 42) in a Palasnath shell; 38 12 1 12 38 (50 1.50) in one from Manbhum The outer laterals are not, as in most allied species of Macrochlamys, bicuspid, but they are long and straight, those inside near the inner laterals have a minute notch near the apex, the inner laterals and medians bicuspid as usual, the outer cusp small

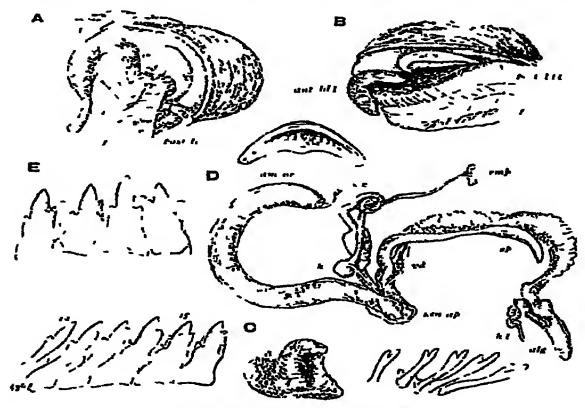
D Species from the Assam Hills, North and South of Valley.

a Labrate

144 Macrochlamys atricolor, Godioin-Austen (Helix-Nanina) J A S B 1875, 2, p 2, pl 1, hg 2, Pfi (Helix) Mon Hel vin, 1877, p 559, Godioin-Austen, Mol Ind 1, 1883, pp 113-117,

pl 24, figs 1-7 (shells), pl 25, figs 1 10 (animal), pl 27, fige 1 & 3 (anatomy and shell) Namua (Macrochlamys) re-plendens, var. atricolor, Nev Hand-l 1, 1878, p 20.

Shell perforate, depressed, rather less thin than in most species of this genus smooth, polished, colour varying from othraceous horny of pale yellowish taking to chestnut-brown, spire low, conoidal, suture slightly impressed, whorls 6, convex above, the



[Fig 44 -Macrochlamys atricular

- A Part of animal, spirit-specimen, snowing manife B Ditto, viewed from left side X I S C F-tremity of foot, viewed from behind X I S Part of animal, spirit-specimen, showing mantle-and shell-lobes × 18

D Genitalia × 18

E Jaw. × 9 and teeth of radula. × 270]

last rounded at the periphery, moderately convex beneath, impressed in the middle, aperture slightly oblique, broadly lunate, thinly labiate and white miside, peristome sharp, the basal margin arcuate, columellar oblique, briefly reflexed above.

Major diam. 221, min. 20, height 11 mm A large specimen

from Manipur measures 28 by 235 mm

Hab North Cachar Hills, higher parts; Burrail Range, Naga Hills, Manipur Hills, Toruputu Peak, Daffa Hills, Kliakhyen (Kachin) Hills, Upper Burma Nevill (1 c) adds Cichai, Tezpur,

Assam, Term and Borpani, but these are very doubtful.

Animal black throughout Right shell-lobe well developed, left shell-lobe overlapping the edge of the peristome, but wanting the tongue-shaped process of M india Left dorsal lobe in two portions, right simple. Generative organs as in M. india; spermatheca very long, kalc-sac rounded Teeth of radula 35.3. 15.1.15.3.35 (53.1.53) Similar in form to those of M india, but the broad inner laterals or admedians more numerous, there being altogether 31 broad teeth in the middle instead of 19.

In typical shells there is no sculpture, but some small specimens referred to this species are longitudinally stricted. The identification is not certain. Nevill classed this species as a variety of coplendens, which is a much thinner shell, devoid of labiation.

[There is also considerable difference in the shell-lobes, and particularly in the generative organs, and resplenders has been

placed in another genus.]

145. Macrochlamys castaneo-labrata, Gadwin-Austen, Mol Ind i, 1883, p 119, pl 29, figs 1-7 (shell, 3 vars, and anatomy).
[Vide tig 45 B, p 105]

Shell perforate, subconoidly depressed, rather solid, regularly imputely and brately sculptured longitudinally under a lens, light brown to pale ochraceous horny. spire low conoid, suture impressed, whorls 6, convex, the last broader, rounded at the periphery, slightly swollen beneath, aperture subvertical, broadly lunate; peristome thin, strongly labilite inside, often some distance within the lip, columellar margin oblique, briefly expanded and rather broadly reflected above, covering the perioration in part

Major diam. $15\frac{1}{2}$, min. $14\frac{1}{2}$, height $7\frac{1}{2}$ min. A smaller specimen measures $13\frac{1}{2} \times 12 \times 7$. Specimens from Manipur Hills measure

 $18\frac{1}{2} \times 15\frac{1}{2}$.

Hab. Buriail Range, Assam Asalu, Hengdan and Japvo

Peaks, Naga and Manipur Hills (Godwin-Austen)

In the animal the shell-lobes are very long and some portions of the anatomy are peculiar. The vas deferens leads to a blunt swollen tube representing the kalc-sac, and this leads to a thick excum, to the side of which the retractor muscle of the penis is attached. The excum is not coiled as in typical forms of Macrochlamys. The amatorial organ is large and terminates in a blunt rounded end. The spermatheca is long and the tree end broader and ovate as usual

The radula contains about 82 transverse rows of teeth, thus arranged 45 2.8 1.8.2 45 (55.1 55) The 17 teeth in the middle are tricuspid and much broader than the others; the outer laterals are simple elongate teeth, more like those of Arrophanta or Oxytes The jaw also is far straighter than usual.

102 zonitip.i

146 Macrochlamys hepatizon, Godiem-Au ten, Mol Ind i, 1888, p 209, pl 53, hgs 3 4 (Shell)

Shell perforate depicsed, discordal, solid, smooth, family strinted transversely, slightly polished, yellowish brown; spire flat, suture moderately impressed, whorks 5, rather closely wound, the last rounded at the periphery, flatly convex beneath, aperture oblique, lunate, peristonic thickened within on basal margin, which is arcuate, columellar margin -inuite, vertical for a short distance above and broadly reflected

Major dram. 14. mm 123, height 5 mm

Hab Hills north and south of Assum Valley, Toruputu Peak.

Dafia Hills, Habiang G iro Hills (Godina-Austen)

This form closely re-embles M.? consepts from Burma, but the whorls are fewer, the size smaller and the colour different.

147. Macrochlamys lata, Godern-Anten, Mol Ind 1, 1888, p 209, pl 53, fig 8

Similar to M. hepatizon but smaller, milky-white or grev in colour the spire slightly higher and the aperture more oblique, with its upper margin sloping outwards and downwards, not horizontal

Major diam 9, min 8-5, height 34 mm

Hub Terra Ghat, khasi Ililis (troduma-Austen).

b Not labrate.

148. Macrochlamys decussata, Br (Narma) J. 1 & B v, 1886, p 330. Pf. (Helv.) Mon Hel 1, 1847. p 70. ml t c m, 1853, p 62 H & 7 (Helv.) C I 1876. pl 112, figs 1, 2, 3, Godein-Insten Mol Ind 1, 1883 pl 19, fig 6 (animals in confi), pl 21, fig 15 (shell-sculpture) (1883)

Shell perforate, depressed, thin, smooth and silky above, polished beneath, under the incroscope decussated above with slightly flexuous transverse strice and fine impressed hirate longitudinal lines, radiately and concentrically stricted below, fulvous horny, spire but little raised, suture slightly impressed, whorls 6-7, slightly convex, regularly increasing, the last subangulate at the periphery in small specimens, rounded in larger shells, base moderately swollen: aperture slightly oblique, lunate; peristonic thin, simple, upper margin nearly straight, basal subarcuate, columellar inclined, briefly reflexed at the perforation.

Major diam 31 mm 27, beight 13 mm

Hab Khasi Halls, common at Cherra Punji The type, measuring 25 mm in major diameter, was subangulate

at the periphery and possibly immature

[The animal has a very long right shell-lobe which can be extended to the apex of the shell, the left is far shorter.]

149 Macrochlamys lhotaensis, Goduin-Austen, Mol Ind 1, 1883, p 107, pl 23, fig. 5 (shell), id t c 11, 1897, p 49
Macrochlamys marshalli, Tryon, Man Conch pt 2, 1886, p 101

Shell very much like that of M. decussata, but having a broader last whorl and different sculpture. The longitudinal (concentric) striction on the whorls above and below is much stronger than the transverse and looks almost costulate under a microscope Subumbilicate, depressed, thin, dark brownish horny, spire low, suture scarcely impressed, whorls 7, flatly convex, the last rounded at the periphery, flattened below; aperture broadly lunate, subovate, columellar margin oblique, scarcely reflected.

Major diam 23, min 20, height 10½ mm Hab Lhota Naga Hills (Godwin-Austen)

I have only seen one specimen of this shell, the type, which is immatuie

150 Macrochlamys 1 ubellocincta, Blf (Nanina) J A S B 1870, 2, p 14, pl 3, iig 9, H & T (Helix) C I 1876, pl 51, figs 5, 6

Lift Mon Hel vii, 1876, p 121

Shell perforate, depressed, thin, smooth, somewhat polished above, more so beneath, finely decussated above with microscopical transverse slightly flexuous strice and fine longitudinal impressed lines, the latter wanting below, inner half of each whorl whitish horny, outer half infous, the latter colour forming a broad library, outer half infous, the latter colour forming a broad library outer half infous, the latter colour forming a broad library sund the periphery, spire almost flat, suture very shallow, whorls 6-6½ slightly convex above, the last subangulate at the periphery, moderately swollen below, aperture slightly oblique, broadly lunate; peristome thin, basal margin subarcuate, columellar inclined, reflected briefly above

Major diam 35, min 31, height 14 mm A smaller specimen

measures 31 by 28 by 12 mm.

Hab Habiang Garo Hills (Godwin-Austen) [This shell has only been found on the Nummulitic limestone south of the Yindku Peak; the animal was not seen]

This-is near decussata, but is distinguished by being much flatter

above and by its very different coloration and sculpture

151 Macrochlamys bilineata, Godum-Austen, J A S B 1876, 2, p 311 pl 8, fig 9

Shell imperforate, subglobosely depressed, very thin, transparent, polished, brownish horny, beneath the microscope very minutely and closely longitudinally striated, the strution not easily seen, spire low, suture impressed, whorks 5, convex, the last well rounded at the periphery and beneath, aperture oblique, roundly lunate; peristome thin, slightly arcuate above and at the base, columellar margin curved, vertical above, slightly reflected

Major diam 12, min. 10, height 6 mm

Hab Tanır Lampa ridge, 4000', Dafla Hills, north of Assam. Abundant in forest amongst fallen leaves (Godwin-Austen)

The animal is described as "pale ochraceous; tentacles black, the black extending on to the neck as two very conspicuous welldefined parallel lines, the upper part of the foot has also two parallel black lines. From the right anterior margin a long tongue-like process is given off which reaches, when partly extended, up to the apex of the shell"

152. Macrochlamys uda, Godinin-Austen, Mol Ind 11, 1899, pp 138, 136, pl 94, fig 1 (spermatophore).

Shell subperforate, depressed to conordly depressed, smooth, polished, very finely and closely striated spirally (longitudinally) throughout under the microscope, pale umber-brown, spire very low, convexly conoid, suture impressed; whoils 6, convex, slowly increasing, the last rather broader, descending slightly towards the mouth, rounded at the periphery, convex beneath, aperture oblique, lunate, peristome slightly obtuse in adults, basal margin arcuate, columellar oblique, nearly straight, slightly expanded throughout, scarcely more so at the junction with the last whorl

Major diam 81, min 71, height 41 mm

Hab Hills on both sides of Assam Valley Found by Godwin-Austen at Toruputu Peak, Dafia Hills, and at the southern base of the range; also in the Gáio, Khási, and Nága Hills, and in

Manipur.

Shells from different localities vary in size, the largest exceeding 10 mm in diameter, and in the height of the spire The species may be recognized by its almost or completely closed perforation and arcuate basal margin of the peristome, also by the slight descent of the last whoil in adults.

Macrochlamys shengorensis, Godwin-Austen, Mol Ind 1, 1883, p 102, pl 22, fig 5, 11, 1007, p 185

Shell perforate, depressed, brownish tawny, thin, polished, with fine, rather close, microscopic linate longitudinal struction throughout above and below, spite almost flat, suture scarcely impressed, whorls 41 (ummature), flat above, the last considerably broader, nounded at periphery, flatly convex beneath, aperture nearly retical, broadly lunate, peristome thin, columellar margin curved, oblique, reflected above, partly covering perforation.

Major diam 11, min 10, height 5 mm

Hab. Shengor Peak, Dafia Hills (Godwin-Austen).

Only immature shells are known These are distinguished by flatness and by the hrate concentuc sculpture

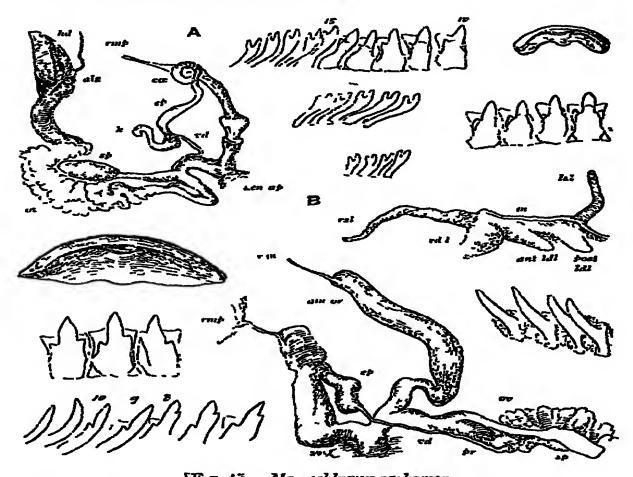
[This has proved to be the young of Staffordia diaflacusts]

153 Macrochlamys cachailca, Godwin-Austen, Not Ind 1, 1883, p 177, pl 27, fig 2 (shell and anatomy) [Fig 45 A, p 105]

Shell openly perforate, depressed, thin, glassy, smooth, brownish

tawny, spire very low, conoidal, suture slightly impressed; whorls G, regularly increasing, convex above, the last carcely broader, rounded at the periphery, flatly convex beneath, aperture slightly oblique, broadly luinate, peristome thin, basal margin slightly arcuate, columellar oblique, reflected above

Major diam 19, mm 171, height 8 mm Hab, Manipur Hills (Godwin-Austen)



[Fig 45—Macrochlumys cacharica

A Generative organs, \times 3, jun, \times 1), and teeth of radula, \times 270

Macrochlamy- castaneo-labrata

B Shell and dorsal lobes, \times 3, separated from the animal, jaw, \times 9, radula, \times 255, and genitalia, \times 3]

Var. glauca, paler in colour and larger, last whorl slightly broader.

Major diam. 22½, mm 19½, height 10 mm

Hab Harmutti, base of Datia Hills, Assam (Godwin-Austen). This shell is very similar to M atricolor It is paler in colour

This shell is very similar to M attroolor. It is paler in colour and larger, the last whorl is rather larger and the base is flatter

and there is no trace of labiation inside the aperture. The anatomy There is no dant-sac, the kale-sac of the differs considerably penis is much longer and the spermatheca short and club-shaped, with the terminal portion orate. The teeth on the radula are arranged thus 38.2.12 1 12.2 38 (52.1.52) and rather peculiai in shape.

*154. Macrochlamys salmonea, Ancey (Nanna-Medyla), Le Nat 11, p 119 (1882)

Shell depressedly convex, shining, thin, horny-ochraceous, spire broadly conical, obtuse, whorls 5, almost not convex, smooth, separated by a shallow suture, inpidly increasing, the last very large, much rounded, umbilicus small, aperture semilunar, scarcely oblique, simple, not thickened nor simuate, briefly reflected at the columellar margin and deflected at the umbilious, the margins united by a very thin callus

Major diam 121, min 101, height 8 mm.; aperture 7 mm

broad (Ancey in Latin)

Hab Cacnai.

"Easily distinguished from *II. bilineatus*, Godwin-Austen, of Daffa Hills, by its larger size, more solid shell, its yellow-ochre colour, and its less globose form."

I am unacquainted with this species

155. Macrochlamys godwini, Tryon, Man Conch ser 2, Pulm 11, p 101 (1886)

Vacrochlamya koliaensis, Liodwin-Austen, Mol Ind 1, October 1883, p 119, pl 26, figs 5-5 a (shell), pl 28, fig 3 (radula), n, 1898, p 50. nec M Loliaensis, Godioin-Austen, op cit i, January 1883, p 86, pl 17, fig 6 (shell)

Shell perforate, depressed, thin, transparent, polished, smooth (no longitudinal sculpture), brownish horny; spire very low, suture impressed whorls 5 (immature), convex, the last broader, rounded at periphery, moderately convex beneath, aperture slightly oblique, broadly lumite, peristome thin, columellar margin much curved, vertical above, expanded throughout, more broadly reflected at the perforation.

Major diam 12, min 10½, height 5½ mm

Hab Koliaghur on Brahmsputra River, Nowgong District,

Assam (Godwin-Austen)

The animal is "dusky green, side of foot grey, spotted with sienia, extremity of toot with gland, having an overhanging lobe long and pointed" Teeth of radula in 93 lows, thus arranged. 42.2 10.1 10 2 42 (54 1 54)

156 Macrochlamys terminus, Godwm-Austen, Mol Ind 11, 1899, pp 134, 130, pl 94, figs 3, 3 a (spermatophore)

Shell perforate, depressed, thin, smooth, polished; spire very low, conveyly conoidal, apex obtuse, suture scarcely impressed. shallow, whorls 6, flatly convex above, the last broader, rounded at the periphery, convex beneath; aperture subvertical, broadly and ovately lunate, margins converging, peristome thin, the basal margin slightly arcuate, columellar margin vertical tor a short distance above, and reflected, then curved and oblique. slightly expanded

Major diam $12\frac{1}{2}$, mm $11\frac{1}{2}$, height 6 mm

Hab. Brahmakund, Eastern Assam; Singpho (M. Ogle), Naga and N. Cachar Hills (Godwin-Austen).

a'. Shell globosi

b'. Strongly or microscopically strate longitudinally

[157 Macrochlamys beata, Godwin-Austen, Mol Ind n, 1899, p 156, pl 108, figs 1-1 b

Shell depressedly globose, rather thin. imperforate, sculpture wavy, strong, regular longitudinal struction, crossed by distant lines of growth colour olivaceous brown, spire low, apex rounded; suture shallow, whorls 5, gradually expanding; aperture orate, oblique, peristome thin; columellar margen oblique, with a very slight reflection

Size maj diam 120, alt axis 45 mm.

Locality. Shengorh Peak, Dafia Hills, 6000 ft (Godium-Austen). Among specimens of this shell, I noticed one which contained a dried-up animal in good preservation. It was put to soak, and after 15 days was examined, when the external characters were remarkably well seen, even to the peripodial grooves and streaks on side of the foot. It has a narrow tongue-like right shell-lobe and a similar well-developed left shell-lobe. After further soaking in water for 24 days, the amatorial organ was well seen and the jaw secured the radula was broken up, but after a long search over three glass slides which had been in use I found and mounted a portion of it. The central teeth have a cusp on the outer side and a small one on the inner apical margin. The admedian are all short and straight-sided, not bicuspid, an unusual character

The shell-lobes are like those of Macrochlamys, and I place it in that genus?

[158 Maciochlamys munipulensis, Godwin-Austen, Mol Ind 11-1899, p 158

Shell very globose and conoid, thin, scarcely and finely perforate sculpture smooth and glassy to the eye, yet under high power and in good light extremely fine fairly regular striation is visible; colour pale straw with a green tinge, spire high, conic; suture impressed; whorls 4½, the last expinding rapidly, well rounded on the periphery; aperture roundly lunate, subvertical; peristome thin; columella very weak, scarcely any reflection, margin suboblique.

Size maj. diam 115, alt. axis 65 mm

Locality N E Munipul Hills (Godwin-Austen) Two specimens in Brit Mus Nat. History collection]

Size: maj diam. 100, min 82: alt axis 40 mm

Locality. Cherra Poonjee and in the valley to the castward

This shell was also found at Jawai, in the Jaintia Hills I have
named it after Sir Joseph Hooker, who describes so well in his
'Himalayan Journals' the deep valley under Cheira Poonjee]

e Upper surface transversely plicate or ribbed

165. Macrochlamys ² plicifera. Blf J A S B 1880 2, p 197

Namma plicatula, Blf J A S B 1870, 2, p 13, pl 3 ing 7;

Godwin-Austen, J A S B 1875, 2, p 2, Pfr (Helx) Mon Hel
vii, 1876, p 126, H. & T (Helx) C L 1876, pl 28, fig 1 · nec
N plicatula, Martens, Nach d Mal Ges 1869, p 149

Shell subobtectly perforate, depressed, almost lenticular, thun, translucent, yellowish horny, with dull waxy lustre, concentrically and subpapillosely striated above and below, plicate near the periphery; spire low, conoidal, suture very slightly impressed whorls 5½, almost flat above, the last much broader, angulate and nodosely plicate at the periphery, swollen truncate, the plications



Fig. 46. - Macrochlamys plurfera

oblique and gradually disappearing on both upper and lower surface away from the outer edge; aperture oblique, roundly lunate, peristome thin, basal margin arcuate, columellar curved, vertical and reflected above

Major diam 221, min 191, height 10 mm

Hab Satunga, N. Cachar Hills, on limestone rocks (Godwin-

Austen).

[Animal pale brown, mottled very evenly with umber over the head and sides, a distinct line of darker colour down the centre of the back; moderately long gland at extremity of foot, which is rather truncate. Two parallel lines run from mantle to the oral tentacles, about 14 inch in length.

I obtained a large number of this species alive, no reference is made to the present of shell-lobes in my note-book, in which there is, besides, a pencil sketch of the animals head as far back as the dorsal lobe. It is therefore very doubtful if it should be

placed in this genus]

166 Macrochlamys shisha, Godwin-Austen (Helix-Nanina), J A S B. 1875, 2, p 2, pl 1, hg 3, Pfi (Hehr) Mon Hel vin, 1877, p 559

Shell obtectly perforate, lenticular, sharply keeled, very thin and fragile, almost membranaceous beneath, translucent, transversely and rather obliquely plicate above, smooth beneath, without longitudinal sculpture, spire low conoidal, suture but little impressed; whorls 5, slightly convex above, the last considerably broader; sharply and compressedly keeled; convex beneath; aperture slightly oblique, angulately lunate, peristome thin Major diam 141, min 121, height 7 mm

Hab North Khasi Hills, Moyong, Dikrang, 2000'; Naga Hills,

Nenglo, in damp forest (Godwin-Austen)

1

All the specimens are imperfect beneath, but the types are probably adult or nearly so. Animal not observed

d. Shells not exceeding about 6 mm (a quarter inch) in diameter. (Generic affinities often doubtful)

a Subglobose or subturbinate

a' Smooth

167. Macrochlamys nengloensis, Godwin-Austen. Mol Ind 1, 1883, p 86, pl 17, figs 3, 5

Shell subobtectly perforate, depressedly turbinate, smooth, without sculpture, faintly polished brownish yellow with an olivaceous tinge; spire conoidal, apex blunt, suture impressed; whorls 5½, convex, rather closely wound, the last subangulate at the periphery, tumid beneath; aperture oblique, lunate; peristome thin, columellar margin broadly reflected, oblique, almost vertical

Major diam 5, min 45, height 35 mm.

Hab Nenglo, Naga Hills, and Manipur (Godwin-Austen)

This appears to be a variety of M longicanda

168. Macrochlamys koliaensis, Godwin-Austen, Mol Ind 1, 1883, p 86, pl 17; fig 6 (shell), nec p 119

Shell imperforate, depressedly tuibinate, thin, smooth, not highly polished above, more so below, without sculpture, light vellowish brown; spire conoidal, suture impressed, whorls 6, convex, closely wound, the last scarcely larger, rounded at periphery, moderately swollen beneath; aperture subvertical, lunate, peristome thin, columellar margin oblique, reflected

Major diam 45, min 4, height 25 mm.

Hab. Kolinghur, Nowgong district, Assam, on low hills near

the Brahmaputra River (Godwin-Austen)

This species is rather more closely wound than M. nengloensis. and the last whorl is rounded, not subaugulate

169. Macrochlamys roberts, Godwin-Austen, Mol Ind 1, 1883, p. 87, pl. 17, fig 17

Shell minutely perforate, depressedly turbinare, thin, smooth, scarcely polished above, more so below, minutely striated transversely, without spiral (longitudinal) sculpture, brownish horny, spire conoidal, apex obtuse, suture impressed, whorls b, convex, rather closely wound, the last rounded at the periphery, tumid below; aperture subvertical, lunate; margins converging, peristome thin, columellar margin oblique, curved, almost vertical above, rather broadly trangularly reflected.

Major diam. 4, min. 3 75, height 2 5 mm

Hab. Angauluo Peak, 6777, Burrail Range, Naga Hills (Godwm-Austen)

This is distinguished from M holicensis by its lower spire and by being perforate

170. Macrochlamys tanırensis, Godwin-Austen, Mol Ind 1, 1883, p 87, pl 17, fig 9

Shell obtectly perforate, subglobosely depressed, thin, polished, smooth, light yellowish brown; spile low, convexly conoid, apex obtuse, suture impressed; whorls 4½, convex, increasing slowly, the last rounded at the periphery, swollen below, aperture nearly vertical, lunate; peristome thin, columellar margin oblique, rather broadly reflected

Diam. 2-8, height 1-75 mm

Hab Tanır Peak, Dafla Hills, 4400' (Godwin-Lusten)

b' Longitudinally structed

171. Macrochlamys longicauda, Godwin-Austen, Mol Ind 1, 1883, pp 84, 85, pl 17, figs 1, 2, 2 a, 4 (shells), pl 20, figs 1 a-e (animal and radula), pl 21, fig 16 (sculpture).

Shell subobtectly perforate, depressedly turbinate, pale horny brown to yellowish tawny, not polished above, and under the microscope marked with two series of very fine oblique strip at right angles to each other (these appear to be wanting in some varieties), smooth and polished below, spire low, conical, apex obtuse, suture impressed, whorls 5½, regularly increasing, convex above, the last angulate at the periphery, turnid beneath, aperture slightly oblique, angulately lunate, peristome thin, columellar margin much curved, expanded throughout, vertical and sharply reflected at perforation

Major diam. 6, min. 56, height 4 mm; smaller specimens

measure 4 to 5 mm. in diameter.

Hab Khası, Jamtia, and North Cachar Hills; Cherra Punji,

Maotherichan Peak, Jawai, Marangsip Peak, &c

Caudal extremity of foot abruptly truncated, lobe above large, mucous pore greatly developed Colour pale, with a dark grey line

on upper surface to extremity of foot Shell-lobes present, the right tongue-shaped. Jaw without median projection Outer teeth in radula numerous and bicuspid, nearly twice as numerous as in M indica, the formula being 76 to 80.3.5 1 5 3.76 to 80 (84 1 84) Middle tooth tricuspid, long, with convex sides, the next 5 long and bicuspid, having a lateral cusp on the outer side only

172 Macrochlamys dorani. Godwin-Austen, Mol Ind i, 1883. p 87. pl 17, fig 8

Shell obtectly perforate, globosely subturbinate, thin, regularly minutely subdistantly longitudinally striated beneath the microscope above and below, light yellowish brown; spire considal, apex obtuse, suture impressed; whoils 5, convex, the last rather larger, rounded at periphery and below, aperture subvertical, lunate, peristome thin, columellar margin almost vertical above, triangularly reflected, the edge projecting slightly convexly above the perforation

Diam. 3 25, height 2 min.

Hab Maotherichan Peak, N Khasi Hills (Godwin-Austen)

This is near M. umbraticola, but has a higher spire, more closely wound whorls, and a different colour. The microscopic sculpture is less close.

The slight projection in the columellar margin above the perforation may indicate that this is a Microsystima.

173 Macrochlamys originaria, Goduin-Austen, Mol Ind 1, 1883, p 91, pl 14, fig 12 (shell).

Shell perforate, turbinately depressed, smooth, with fine longitudinal striction, sienna-brown; spire conoidal, sides convex. apex obtuse, suture impressed; whorls 4½, convex, the last slightly subangulate at the periphery, turnid beneath, aperture subvertical, ovately lunate, peristome thin, columnly margin oblique, broadly reflected above

Major diam 2, height about 1.5 min

Hab. Shenghor and Toruputu Peaks, Dafia Hills, north of Assam (Godwin-Austen).

174 Macrochlamys umbraticola, Goduin-Austen, Mol Ind 1, 1883. p 89, pl 14, figs 4 (shell), 4 a (sculpture)

Shell obtectly perforate, globosely subturbinate, pale olivaceous blown, very minutely regularly spirally (longitudinally) stilled beneath the microscope above and below, spire convexly considered, apex obtuse, suture impressed, whorls 4½, convex, the last not descending, rounded at the periphery and beneath, aperture slightly oblique, roundly lunate; peristome obtuse, in one plane, columellar margin nearly vertical, carried forward and slightly reflected, almost or quite covering the perforation

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XOYI LIDÆ

Major diam 3-5 min. 3, height 2 mm.

Hab Hengdan Peak, North Cachar Hills. Jatunga Valley and Kopamedza Peak (8376'), Naga Hills.

The type measured 43 mm in major diameter.

a'. Depressed or conordly depressed.

b". Longitudinally striated

175 Macrochlamys 2 sata, Godwin-Austen, Mol Ind 1, 1888, p 91, pl 14, fig 13

Shell imperforate, depressed, thin, polished, very finely longitudinally (spirally) striated under the inicroscope, pale brownish horny; spire very low, npex obtuse, suture impressed; whorls 4½, convex, the last rounded at the periphery, convex beneath, aperture nearly vertical, roundly lunate, peristome thin, columniar margin oblique.

Diam 2, height scarcely 1 mm

Hab. Shenghor Peak (6706') and Toruputu Peak (7322'), Dafia Hills in Eastern Himalayas, north of Assam; one specimen from each locality.

176 Macrochlamys pacata, Godwn-Austen, Mol. Ind i, 1883, p 90. pl 14, hg 10

Shell obtectly perforate, almost imperforate, depressed, thun, smooth, moderately polished, under the microscope subdistantly longitudinally (spirally) striated above and below; spire very low, apex obtuse, suture impressed; whorls 4½, convex, the last rounded at the periphery, somewhat swollen beneath; aperture subovately lunate, slightly oblique; peristome thin, columellar margin much curved, vertical and reflected above, almost covering the perforation

Major diam. 3, min. 2½, height 1½ mm

Hab Lhota Naga Hills.

The type, apparently the only specimen known, is not fully grown

177 Macrochlamys rusticula, Godunn-Austen, Mol Ind 1, 1883, p 87, pl 17, fig 10

Shell obtectly perforate, conoidly depressed, thin, smooth, not polished above, translucent, pale brown, spire low, considal, suture impressed, whorls 4, convex, the last rather broader, iounded at the periphery, flatly convex beneath; aperture subovately lunate, peristome thin, columellar margin oblique.

Diam. 21, height 1 mm Hab North Khasi Hills.

The only specimen is probably immature. There is an indistinct appearance resembling sculpture under the microscope, but no striction can be made out

E. Species from Burma, Arakan, and Tenasserim

a Peristome labrate

178 Macrochlamys? consepta, Bo (Helix) A.M. N. H. (3) vi, 1860, p 190, vi, 1863, p 320, Pfi (Helix) Mon Hel v. 1868, p 239, H. & T (Helix) C. I. 1876, pl 88, figs 5, 6, Godn m-Austen, Mol Ind. 1, 1888, p 209, pl 53, fig. 1. id. 1883, p 110, pl 26, fig. 4 (small var, more globose), id. P. Z. S. 1888, p 241 (small var)

Shell subperforate, depressed, almost discoidal, not thin, smooth, polished, glassy, whitish horny, spire almost flat, apex slightly iaused, suture impressed; whorls 7, convex, closely wound, the last not much broader, rounded at the periphery, slightly convex beneath, impressed in the umbilical region; aperture almost



Fig. 47.—Mucrochlamy C : consepth

vertical, broadly lunate, peristonie blunt, white and narrowly labiate within, basal margin slightly are nate, columellar oblique. expanded and reflected above, almost completely closing the perforation

Major diam 18, min 16, height 7 mm

Hab. Damathat near Moulmern, Muleyit Range (4000'); Upper

Burmah, Shan States?

Benson described the type as obsoletely spirally striated, but no sculpture can be detected on numerous specimens examined. Easily recognized by its almost flat whitish glassy shell. animal is not known and the generic relations are doubtful.

a' Smootk

179. Macrochlamys ² petasus, Br (Helix) A M N H (3) 111, 1859, p 388, Pfr (Helix) Mon. Hel v, 1868, p 197, H & T (Helix) C I 1876, pl 80, figs 8, 9, Nevill, Nanna (Microcystis), Hand-1, 1878, p 35, Godwin-Austen, Mol Ind 1, 1883, p 210, pl 53, fig 6 (shell).

Shell subobtectly perforate, depressed, smooth, polished, yellowish tawny; spine low, convexly conoid, suture scancely impressed; whoils 5-6 increasing slowly, flatly convex above, the last rounded to slightly subangulate at the periphery, convex beneath; aperture subvertical, broadly lunate, peristome blunt, very narrowly labiate inside at the edge, basal margin slightly arcuate, columellar oblique, rather broadly reflected above

Major diam 10½, min 9½, height 5 mm. *Uab* Phiethan, Tenasserim Valley. I I wrongly regarded as identical a snail common about Thayetmyo in Pegu and in the Arakan Hills, now distinguished as M notha. Nevill refers to

this species shells from Arakan, the Assam Hills, and near Darpling, but the identification requires further comparison.

| Fide p '35, Nevill's 'Hand-list' -

Only the shells from Phiethan belong to this species

I have gone through most of the shells referred to petasus from localities in the Assam Hills and Darpling, sent home to me by Mr. G Nevill, they all belong to different species; those recorded from Toruputu, Borpani, Tann Peak, and Dikrang are M uda, Godwin-Austen

Same page, " Var (9 distinct species)" —

From places in the Dafia Hills belong to a form yet to be described

Same page "Var ("distinct species)" — 12 Alakan are subpetusus Godwin-Austen

Page 36 ---

2 Boi pani, 3 Khasi Hills, 10 Dikrang me hepatizon, Godwin-Austen, var

3 Needoungtoung=subpetusus, G-A]

180 Macrochlamys? aspides, Bs (Helix) A M N H (3) x1, 1863, p 320 Pf; (Helix) Mon Hel v, 1868, p 197 H & T (Helix) C I 1876, pl 62, figs. 7, 8, 9, Theob Cat 1876, p 17

"Shell obtectly perforate, orbiculately depressed, scarcely structed, smooth, polished, horny, subdiaphanous. spire somewhat convex, flattish, apex slightly raised; suture faintly impressed, submarginate, whorls 6, very slightly convex, slowly increasing, the last finally broader, aperture oblique, broadly lunate, peristome briefly lying open (very slightly expanded), thickened and white inside, broader below, upper margin prominent and much arcuste; basal margin arcustely bisinuate, columellar very short, slightly reflected above, its border narrowly callous" (Bs., Latin.)

Major diam 11, min 9, axis 5 mm

Hab Tenasserim (Theobald)

Distinguished by the strongly arcuate and thickened basal maigin of the peristome

b Peristome not labrate

181 Macrochlamys chaos, Blf P Z S 1904, 11, p 444, pl 25, fig. 8

Shell perforate, conoidly depressed (subglobose), thin, smooth, transversely striated, and with microscopic, very fine, close, flexuous, longitudinal (spiral) sculpture, vitreous, pale fulvous or whitish horny, spire low, apex acute, suture impressed; whorls 5½, slightly convex, the last broader, rounded externally, convex beneath; aperture oblique, roundly lunate, the breadth exceeding the height, peristome very thin, in one plane, columellar margin curved, vertical above and briefly triangularly reflected.

Major dinin 16 min 14, height 8 mm. A small specimen

measures $13 \times 12 \times 7$

Hab Pegu, Thayetmyo; Upper Burma, Tsingu nem Ava.

(W.T.B)

This species resembles M. subjecta (p. 98), but is distinguished by being more lustrous and globose, and by its narrower last whorl and smaller mouth, as well as by its longitudinal struction, which is sometimes difficult of detection

a". Longitudinally (sprially) structed

182 Macrochlamys kumahensis, Theob & Stol J 1 & E 1872, p 334, pl 11, hgs 9, 10, Pf: (Helix) Mon Hel vii, 1876, p 531, Nevill (Nanina), Hand-l 1, 1878, p 25
Nanina ramnensis, Blf, Nevill, Hand-l 1, 1878, p 24 (no description)

Shell openly perforate, depressed (almost subglobose), thin, smooth, polished, with close, minute, longitudinal (concentric) striation, only visible under a microscope, above and below, yellowish to brownish tawny, spile low, suture rather well impressed; whorls 4½, convex, subangulate outside the suture; the last considerably broader, well rounded at the periphery and rather turnid below; aperture oblique, roundly lunate, almost circular, peristome thin, straight, columellar margin much curved, becoming vertical above, and rather broadly triangularly expanded

Major diam. 91, min 81, height 51 min

The form named rammensis (but never described) is slightly larger, measuring 10½ mm in diameter, and has a rather larger

mouth, but, as suggested by Nevill, is not distinguishable.

Hab. Kumah Hill near Sandoevay, Arakan (Theobald); Ramri Island, Arakan coast (W. T. B.) Also recorded from Bhamo, the Dafia Hills, and Borpani, Assam, with doubt by Nevill. [These are different species.]

A well-marked species, somewhat resembling M. subjecta in shape

183 Macrochlamys causia, Bs (Helix) A M N H (3) ii, 1859, p 388, Pfr (Helix) Mon Hel. v, 1868, p 118, H. & T (Helix) C I. 1876, pl. 90, figs 2, 3, Nevill, Namna (Microcystis), Hand-l 1, 1878, p 36, no 142 [from Salwin River is the next species]

Shell perforate, subglobosely depressed, rather solid, obliquely striated and, under the microscope, marked with minute, close, spiral (longitudinal) lines, smooth, not highly polished, pale yellowish horny, whiter beneath; spire conoidal, apex obtuse, suture impressed, whorls 5, convex, the last considerably broader, rounded at the periphery, moderately swollen beneath, aperture large, oblique, roundly lunate; peristome thin, straight, columellar margin vertical, produced forward around the perforation and sharply reflected

Major diam 62, min. 52, height 4 mm

Hab Phiethan, Tenasserim Valley (Theobald), Salwin River (Hunger for d, teste Nevill).

h'. Subglubosely dem essed

Smooth

[184 Macrochlamys salwinensis, Godioin-Austen, Mol Ind 11, 1907, p 163, pl. 109, hg 9

Locality Salwin Valley

Shell globosely conoid, scarcely perforate, quite smooth, colour ochraceous, spire moderately high, apex rounded, whorls 5, regularly mereasing, somewhat conver, aperture oblique, semiovate, columellar margin vertical, peristoine slightly reflected Size maj. diam 67. min. 58, alt. axis 35, body-whorl

28 mm

This shell was sent by Mi Nevill to me as No 142, p 36, of his 'Hand-list' Namina (Microcystis) causiu, Bs, from the Salween It agrees very well with the figure in the Conch Indica (pl 90, ings 2, 3), which was possibly a typical specimen, as it is recorded on p 37 as from Phiethan, Tenasserim, and should now be found in the McAndrew Collection at Cumbudge, among Benson's shells]

185. Macrochlamys 2 dugasti, Morelet, Jour Conch 1891, pp 25, 239, pl 5, figs 1, 1a, lift Proc Mal Soir v, 1003, p 275

Helry cycloidea, apud H & T C I 1878, pl 88, figs 8, 9, Newll,
Namua (Microcystis), Hand-l 1, p 36 (1878). Theob. (Macro-chlainys) Cut 1876, p 18, Kohell (Macro-chlainys), Mart &
Chemn Syst Conch-Cab 1401, p 1040, pl 265, figs 10, 11 new
Namua cycloidea, Albirt, Mal Bl 1v, 1857, p 89, pl 1, figs 1-3

Shell perforate, subglobosely depressed, deep, thin, horny, isabelline, often paler beneath, polished, without longitudinal (apnal) sculpture, spire low, considal, suture impressed, whork-6-8, closely wound, convey above, the last but little broader, much rounded at the periphery, not turnd beneath, aperture



Tig 48 -Mariochlamys dugaste

oblique, sometimes descending slightly, broadly lunate, much broader than high, peristome blunt, whitish, basal margin slightly arcuate, columellar obliquely curved, not vertical, brought forward

and slightly reflected at the perforation

[Only a part of the anunal has been seen by me in a dried-up specimen, on sonking it out. The loot is divided longitudinally into three areas, there were the usual peripodial fringe and grooves, and a short overhanging lobe above the mucous pore The law is curved slightly, but has no median projection on the cutting-edge. The hieth of the radula are arranged in rows

of 40 2.9. I 9 2 40 (51.1 51) teeth. The median tooth is tricuspid; the admedians have each a single cusp on the outer side, the marginals are minute and bicuspid. The genitalia could not be made out?

Major diam 131, min 12, height 9 mm.

Hab Near Moulmein (Theobald); Phaboo, Salwin Valley (Hunger ford) Common in the Upper Menam Valley and around

Ching Mai in Siam.

There is some variation in size and in the height of the spine: a small Burmese specimen measures 12, 11, and 7½ mm. in its three diameters, a large Siamese shell 15, 13½, and 9½. The species is easily distinguished from all other Burmese and Indian Macrochlamys by its great height compared with its diameter. It is impossible to identify it with Albers's Nanna cycloidea, which measured 20 mm in major diam by only 9 in height, and which was of unknown origin, though supposed to be Himalayan

b". Depressed or conordly depressed

b". Smooth

186 Macrochlamys subpetasus, Godwin-Austen (Nevill, MS), Mol Ind 1, 1888, p 211, pl 53, ing 7 (shell). Helix aspides p, Blf (nec Bs) J A S B 1865, pt 2, p 86

Shell minutely and subobtectly perforate, convexly depressed, polished, smooth, without sculpture, light brown, spine low, convexly conoidal, suture slightly impressed; whork 6, convexinceasing slowly, the last rounded at the periphery, convex beneath; aperture subvertical, lunate; peristome thin above, basal margin slightly obtuse, columellar oblique, much curved, slightly expanded, more so near the perforation.

Major diam 8, min. 7½, height 4 mm

Hab. Arakan Hills on west side near Tongoop, and Bassein District, Pegu, west of Bassein River Common.

187 Macrochlamys noxia, Bif P Z S 1904, 11, p 444, pl 25, fig 14

Shell minutely and subobtectly perforate, depressed, thin, smooth, polished, without sculpture, rufescent brown (light chestnut), whitish beneath except near the periphery; spire very low, conoidal, suture impressed, whorls 6, convex, not increasing rapidly, the last rounded at the periphery, convex beneath, aperture slightly oblique, lunate; peristome thin, basal margin arcuste, columellar oblique, briefly reflected above

Major diam 9, min. 8, height 4 min A large shell measures

10×9×4}

Hub Bassem District, Pegu, west of Bassem River.

A variety from Akyab in Arakan has 5 whorls and a slightly

higher spire.

This is distinguished from M hypoleuca by being more depressed and more narrowly perforate, and by the complete want of sculpture, and from M. subpetasus by larger size lower spire, &c

b'. Longitudinally struted

188. Macrochlamys nebulosa, Blf (Namua) J. A. S. B. 1865, p. 66, 176 (Helix) Mon. Hel. v., 1868, p. 79, H. & T. (Helix) C. I. 1876, pl. 64, tigs 8, 9, 10, Nevill, Namua (Macrochlamys), Hand-1 1, 1878, p. 23

Shell perforate, conoidly depressed, sublenticular, thin, pale horny, not polished, but with a dull greasy lustre above, more polished below, smooth, minutely spirally striated (the strine only visible under a microscope) above, not below, spire low, conoid, suture impressed; whorls 6, convex, slowly and regularly increasing, the list a little wider, subangulate at the periphery, angulate in young shells, convex beneath aperture slightly oblique, roundly lunate, breadth exceeding height, peristome thin, columellar margin slightly expanded, almost vertical and briefly reflected above

Major diam 12, min 11, height 6 mm

Hab Northern Pegu, Akoutoung, S. of Prome, Thayetmyo Chiefly distinguished by its dull greasy lustre above and subangulate or angulate periphery.

189 Macrochiamys notha, Bif P Z S 1904, n, p 444, pl 25, fig 19
Numma petasus, Bif (nec Benson) J A S B 1865, 2, p 86

Shell perforate, depressed, not highly polished, smooth to the eye or faintly stricted, but under the microscope ornamented above and below with fine close concentric (longitudinal) parallel raised lines, which, under a higher power, are found to be rows of minute monilitorm tubercles, yellowish tawny, spire low, conoidal, aper subacute, auture impressed, whorls 6-7, slightly convex, slowly increasing, the last rounded at the periphery, convex beneath, aperture very slightly oblique, almost vertical, lunate, peristonic thin, basal margin arcuate, columnlar slightly expanded, very briefly vertical above, then obliquely curved

Major diam 111, nun 101, height 6 mm

Hab Tongoop Pass, Ankan Hills, and neighbourhood of Thatet-

myo, Pegu.

This shell resembles the Temasserim M petusus (p 115) closely in shape and colour, and I long regarded the two as identical but M nother is distinguished by wanting the labiation of the Temasserim species, by being less polished, and by its sculpture, which can only be seen under a microscope

190 Macrochlamys hypoleuca, Bif (Namna) J A S B 1865, 2, p 67, If (Helix) Mon Hel v, 1868, p 104 H & T (Helix) C I 1876, pl 64, hgs 6, 7, Net all (Macrochlamys), Hand-l v, 1878, p 26

Shell openly perforate (narrowly umbilicated), depressed, thin, smooth, polished, with very fine microscopic spiral (longitudinal) struction (which is often obsolete) above and below, chestnut above, whitish beneath, spire very low, considal, suture impressed;

whorls 5, not increasing rapidly, convex, the last rather broader, rounded at the periphery, convex beneath; aperture slightly oblique, broadly lunate, peristome acute, basal margin faintly arcunte, columellar margin curved, vertical and reflected above

Major diam. 12, min. 101, height 6 mm.

Hab Pegu, the types from Akoutoung on the Irrawady below Prome; also found at Thayetmyo, and according to Nevill at Bhamo

Easily recognized by its peculiar coloration. The sculpture is often obsolete on the upper surface, but can generally be seen beneath by the help of a microscope

191 Macrochlamys spreta, Bif P Z S 1904, 11, p 445, pl 25, fig. 12.

Shell minutely and subobtectly perforate, depressed, thin, smooth, polished, finely striated with microscopical spiral (longitudinal) impressed lines above and below, light rufescent brown (pale chestnut), whitish at the base around the perforation, spire low, conoidal, suture shallow, whorls 5, convex, the last rather broader, rounded at periphery, convex beneath; aperture oblique, subovately lunate, penstome thin, straight, columellar margin oblique, slightly reflected

Major diam. 8, min 7, height 3½ inm

the Irrawady River in Pegu.

This resembles M. hypoleuca and M. novia in colour and form, but is distinguished by its marked longitudinal sculpture as well as by its smaller size

[192 Macrochlamys andersoniana, Nevill

Nanna honesta, wa andersoniana, Nevill vide Appendix to Genue, p 141

M honesta, var tenuioi, Nevill, MS vide Appendix, p 141]

[Macrochlamys honesta, Gould, which was inserted here in Di Blantoid's MS, is placed in a new subgenus.]

193 Macrochlamys patens, Blf P Z & 1904, n, p 445, pl 25, fig 15

Shell narrowly but perspectively umbilicate, conoidly depressed, sublenticular, smooth, polished, marked with parallel microscopic spiral (longitudinal) impressed lines, not close together, but at irregular intervals, above and below, tawny brown, spire conoidal, suture slightly impressed, whorls 42, convex, the last rather broader, bluntly angulate at the periphery, convex beneath, compressed around the umbilious, aperture diagonal, subtrape/oidal, almost securiform, peristome thin and straight, columellar margin oblique, trangularly reflected

Major diam 7, min 6, height 3½ mm

Hab Irrawady Valley, Pegu, Thayetmyo, Bassem.

In many respects this shell resembles M. honesta, but is

distinguished by its umbilious, sculpture, &c., besides its very much smaller size

Animal light giey. A very small lobe overhangs the small-mucous pore.

c Shells not exceeding 6 mm (Generic position very doubtful)

a' Turbinate

194 Macrochlamys? pung: Theobald (Helia), J. A. S. B. 1859 p. 307, Pfr. (Helia) Mon. Hel. 1, 1868, p. 134, H. & T. C. I. 1876, pl. 16, fig. 9, Nevill, Namua (Microcystis), Hand-I., 1878, p. 38, Godwin-Austen (Macrochlamys?), Mol. Ind. 1, 1882, p. 90, pl. 14, fig. 1 (shell)

Macrochlamys poongs, Theobald, Cat. 1876, p. 19

Shell perforate, turbinate, lather thin, chestnut-brown, with very close microscopic sculpture of fine impressed longitudinal lines, hardly visible on the upper whorls; spire conoidal, suture deep; whorls 6½, convex, regularly increasing, the last not descending, rounded at the periphery and below, aperture almost vertical, roundly lunate; peristome thin, right inargin slightly arcuate, columellar slightly expanded, vertical above and triangularly reflected

Major diam 65, min 6, height 5 mm. Hab Moulmein (Theobald, Stoliczka)

Near M.? molecula, but larger and higher in the spine. The measurements are those of a large adult shell, smaller specimens are 5 to 6 mm across

b'. Depressed or conordly depressed

a". Smooth

195 Macrochlamys? molecula, Es (Helix) A M N H (3) 111, 1859, p 389, If (Helix) Mon Hel v, 1868, p 69, Stol (Microcystis) J A S B 1871, 2, p 251, pl 18, hgs 11-13 (anatomy) H & T (Helix) C I 1876, pl 32, hgs 8, 9, Nevill, Nanina (Microcystis), Hand-l 1, 1878, p 38, Godwin-Austen, Mol Ind 1, 1882, p 88, pl 16, hg 8 (shell)

Shell narrowly periorate, depressedly conoidal, thin, smooth, without longitudinal sculpture, brownish horny, approaching pale chestnut in colour; spire low, conoid, with convex sides and obtuse apex, suture well impressed; whorls 5-5½, rather closely wound, convex above, the list rounded at the periphery and convex beneath; aperture scarcely oblique, broadly lunate, peristone thin, straight, columellar margin oblique, slightly curved, very briefly reflected above

Major diam 5, mm 4, height 3 mm

Hab Rangoon (Theobald), Moulmenn (Steliezka), common; also Kalma Doung, near Ava (W T. B.), Assam? and Khasi Hills? (teste Nevill), Lampin, Shim (Daly, see Proc Mal. Soc v, p. 275) A common and widely distributed form

Anunal grey to black foot narrow, sole with two grooves.

Left mantle-lobe (shell-lobe) reflected over the outer lip, but not much produced, light-mantle-lobe above shortly linguate. Tailgland distinct, with a hook-like appendage above. Genitalia simple, no spermatheca nor dart-sac was seen; penis very simple, with a small kalc-sac at the point where the vas deterens joins. Jaw broad, smooth, with a projection in the middle inside. Teeth of radula in straight transverse rows of about 120 each; middle tooth of each row represented as quinquecuspid, having two lateral cusps on each side, the terminal cusp long, pointed, and curved, inner laterals with two outer lateral cusps and one inner one, outer laterals bicuspid, with an outer basal lateral projection. (From Stoliczka's notes.)

196 Macrochlamys? curvilabris, Bif. P Z S 1904, 11, p 445, pl 25, fig 18.

Shell perforate, depressed, brownish, smooth, polished, scarcely stricted, spire very long, suture well impressed; whorls 5½, regularly increasing, convex above, the last descending somewhat towards the aperture, rounded at the periphery, flatly convex beneath, aperture oblique, broadly lunate, peristome obtuse, white and thickened inside, and much curved, upper margin slightly arcuate, basal prominently curved forward in the middle, columellar oblique, slightly reflected

Major diam 5½, min. 5, height 2 mm.

Hab Alakan Ilills west of Prome

This is the small form, "with the curvature and thickening of the peristome evaggerated," mentioned amongst the Burmese shells collected by me in 1860-62 (J.A. S.B. 1865, 2, bottom of p. 86). It is almost a miniature of M. aspides

b". Longitudinally streated

197. Macrochlamys ² perpaula, Bs (Helix) A M N H (3) 111, 1859, p 390 Pfi (Helix) Mon Hel v, 1886, p 69, Newll, Namua (Microcystis), Hand-I 1, 1878, p 37, Godwin-Austen, Mol Ind 1, 1882, p 89, pl 14, fig 5

Shell minutely perforate, depressedly globose, smooth, not polished, obliquely stricted, and very minutely spirally (longitudinally) libbed throughout, umber-brown, spire conoidly convex, apex blunt, suture impressed, whorls 4, gradually increasing, convex, the last rounded at periphery and below, aperture oblique, lunate, peristome straight, acute, columellar margin oblique, slightly reflected above.

Major diam. 2, min $1\frac{2}{3}$ height $1\frac{1}{3}$ min.

Hab. Phiethan, Tenasserim (Theobald), Moulmein (Stoliczka) Nevill refers to this species shells from Thayetmyo, Arakan. Darjing, and Pareshnath [the last two are very unlikely]

Allied to M molecula, but, besides its much smaller size, it is

more globose (Benson)

^{*} This may be due to an error of observation, as in the case of Silala infela

198 Macrochlamys? pauxillula, *Bs* (Helix) *A M N H.* (3) m, 1859, p 390, *Ph* (Helix) *Mon Hel* v, 1868, p 119, p *H & T* (Helix) *C I* 1876, pl 90, figs 7, 8, 9, *Newll*, Namus (Microcystis), *Hand-l* 1, 1878, p 37

Shell perforate, depressed, thin, brownish horny, polished, marked with close, very fine, longitudinal (spiral) lines above and below, spire convex, suture impressed, whorls 4, convex, regularly increasing, the last rounded at periphery and below, aperture oblique, broadly lunate, peristome thin, straight, columellar margin curved, expanded and carried slightly forward above

Major diam 24, min 24, height 14 mm.

Hab. Thayetmyo, Pegu (Theobald, W. T. B), Prome

The specimens described above, though somewhat larger, agree with Benson's description and are from the same locality. The shell figured in the 'Conchologia Indica' looks different, and may be M. curvilabris

Another form, also from Thayetmyo, is thicker, it has a higher, more convex spire, and stronger concentric striction This may be regarded as a variety

F. Species from Andaman and other Islands in Bay of Bengal.

a. Depressed.

199. Macrochlamys chomix, Bs (Helix) A M N. II (3) vii, 1861, p 83, Pfr (Helix) Mon Hel v, 1868, p 117, H & T (Helix) C I 1876, pl 51, fig 1, Godwin-Austen, Mol Ind i, 1883, p 102, pl 22, fig 6, 11, 1898, p 48, td. A M N H (6) 11, 1888, p 57.

Shell obtectly perforate, depressed, thin, translucent, scarcely structed, smooth, with fine, close, spiral (longitudinal) limes, only visible under a strong lens, on the upper surface, brownish horny, spire very low, suture scarcely impressed, almost flat, whorls 5, flat above, the inner rather closely coiled, the last broader, subangulately rounded at the periphery, moderately convex beneath, aperture oblique, large, broadly lunate; peristome sharp, upper margin arcuate, columellar much curved, vertical above and briefly reflected, partly covering the perforation

Major diam 16, min 14, height 7 min. Hab Mount Harriet, South Andaman

Distinguished by few whoils, much broader last whorl, and the flattened upper surface. The animal, according to Nevill, 19 very active and throughout black, except the sole of the foot, which is white

Macrochlamys choinia, vai gigantea, Nevill (G-A, P.Z. 1895, p. 446; Mol Ind 11, p. 48), from South Andaman Island,

has never been described.

200. Macrochlamys pseudochoinix, Bif. P Z. S 1904, ii, p 446, pl 25, fig 10

Shell subobtectly perforate, depressed, thin, smooth, slightly polished, brownish horny, subobsoletely plicately striated transversely and marked with fine, close, microscopic, slightly flexuous, spiral (longitudinal) lines above and below, spire very low, suture scarcely impressed, almost flat; whorls 5, rather flat above, the last much broader, rounded at the periphery, swollen beneath; aperture oblique, subdiagonal, large, subovately lunate; peristome acute, upper margin arcuate, columellar much curved, vertical above, briefly reflected, paitly covering the perforation

Major diam 14, min 12, height 7 inin. Hab Great Cocos Island, Bay of Bengal

Near M. choinia, but considerably more turned beneath, with rather higher spire and much stronger spiral sculpture. The aperture is much rounder, being very little broader than high, 7×7.5 mm. whilst in a specimen of M. choinia the dimensions are 7×8.5 mm.

201. Macrochlamys exul, Theoli (Helix) J. A. S. B. 1864 p. 245;

Stol (Helix) P. A. S. B. 1870, p. 87, H. S. T. (Helix) C. I.

1876, pl. 62, figs. 1, 2, 3, Nevill Hand-l. 1, 1878, p. 23. GodwinAusten, Mol. Ind. 1, 1883, p. 103, pl. 22, fig. 3 (shell), 11, 1907,

p. 165, pl. 111, figs. 2-2 d. (part of animal, genitalia, & radula)

Orobia (Helix) andamanensis, Tiyon, Am. Join. Conch. 1, 1869-70,

p. 110, pl. 10, fig. 4, Pfr. Mon. Hel. 11, 1876, p. 108

Shell subobtectly perforate, considly depressed, smooth, not highly polished, with fine, close, longitudinal striation (sometimes indistinct) under the microscope, translucent, light brownish horny; spire low, considal, sides rather convex, apex obtuse, suture shallow; whorls 6, gradually increasing, the last somewhat compressed and very bluntly angulate at the periphery, convex beneath, aperture oblique, lunate, almost semioval; peristome thin, columellar margin oblique, triangularly reflected above, partly covering the perforation

Major diam. 15½, min 14, height 7½ mm A large specimen

measures $17 \times 15\frac{1}{2} \times 9$.

Hab Port Blair, in South Andaman

The height of the spire varies, and immature specimens appear flatter, more closely wound, and much more angulate than adults. Such shells appear to be frequently mistaken for *M stephus*, but may be distinguished by the subangulate periphery and oblique aperture.

[Animal ochiaceous in spirit. Foot divided on the sole, extremity rounded; mucous gland large, with a blunt overhauging lobe. Right and left shell-lobes are present, the latter apparently larger than usual in the genus. In the generative organs the penis has a coiled exerum; a long retractor muscle given off from it. The

epiphalius thence to the junction of the vas deferens is very long, and at the junction gives off a long kale-sac. The amaterial organ is long The spermatheca consists of an oval sac at the end of a thickened stem

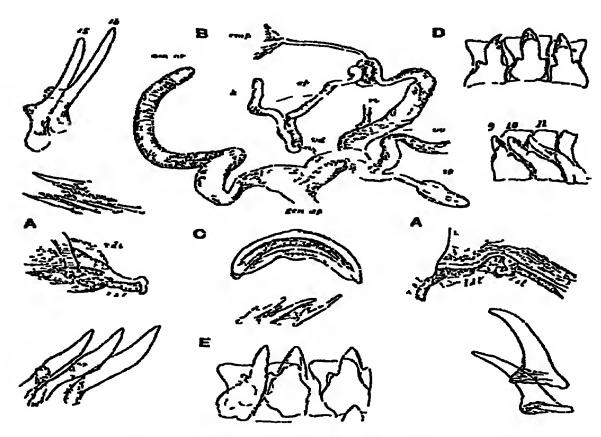


Fig 49 -Macrochlamus evul

- A Postions of the mantle-zone showing shell- and dorsal lobes ×33 B Generative organs ×6
- C Jaw ×18

or

D Teeth of the radula

Macrochlamys heata

E Teeth of the rade a ×413

Jaw moderately curved, with a slight median projection. Radula formula.

Central tooth rather short, with small blunt basal cusps; the admedian teeth on quadrate plates, blunt cusps low down on outer margin; the laterals are long, aculeate, and slightly curved, becoming very short on the outer margin.

This indula is very different from that of typical Maciochlamys, and so is the genitalia, and if it should be common to all the Andaman species it would constitute them a good subsection

Aculeate laterals have been noticed in the following species — M jamana; M. castuneo-labrata, in M tugurum the outermost teeth; and in M. dalingensis they are nearly aculeate]

202. Macrochlamys stephus, Es (Helix) A M N H (3) vii, 1861, p 84, Ifr (Helix) Mon Hel x, 1868, p 105, P H & T (Helix) C I 1876, pl 62, figs 4, 5, 6, Nevill, Nanina (Macrochlamys), Hand-l 1, 1878, p 23; Godwin-Austen, A M N H (6) 11, 1888, p 56, id P Z S 1895, pp 441, 446, id Mole Ind 11, 1898, p. 50

Shell narrowly perforate, depressed, smooth, with faint microscopic traces of minute, close, spiral (longitudinal) striction, polished, pale yellowish or greyish brown; spire very depressedly conoidal, suture faintly impressed, whoils 6-7, slightly convex above, increasing slowly and regularly, the last rounded outside, obtusely subangulate above the periphery in immature shells, convex beneath; aperture slightly oblique, limate, peristome thin, upper margin straight, basal slightly arcuste, columellar oblique, expanded throughout the greater part of its length, more broadly above

Major diam 12½, min 11, height nearly 6 mm. A rather smaller specimen with 6 whorls measures $11½ \times 10½ \times 5$ mm.

Hab Mount Hairiet, Port Blair, South Andaman Island. Benson's type measured only 10 mm in major diameter. The figures in the 'Conchologia Indica' are not good, and

the figures in the 'Conchologia Indica' are not good, and haps represent a different shell. II. stephus may be recc. by its closely-wound whorls, low spire, and want of dissculpture under the microscope.

Animal throughout yellow, except the tentacles, which

black, sole of foot also yellow (Nevrll).

[In a specimen recently examined, sent home from South Andaman Island, a minute left sh contracted and hooked in the spirit-specimen.' way and brittle, it would very readily be thas a small coiled cæcum, the jaw a small the radula the laterals are slightly curved formula is

in all respects similar to that of M. exul.]

*203 Macrochlamys woodmasoni, C Ind i, 1888, p 209, pl 53, Macrochlamys woodmasc pp 441, 416

"Shell not quite mature, perf-

globose, glassy, rather solid; sculpture quite smooth; whorls 6, closely wound, flat above, subangulate above on periphery.

"Major diam. 95, min 8, alt. axis 35, body-whorl 28 mm."

(Godwin-Austen)

Hab. Lattle Cocos Island, Bay of Bengal

The figure represents a discordal form, not unlike that of M consepta, with a scarcely exserted spire. The shell is deep and turned beneath, and the greatest diameter much nearer to the spire than to the base.

b Depressedly conoid, more or less lenticular.

204. Macrochlamys aulopis, R. (Helix) A M N II (3) xi, 1863, p 318, H & T (Helix) C I 1876, pl 30, figs 8, 9, Nevil (Nanna), Hand-l 1, 1878, p 32

(Namna), Hand-1 1, 1878, p. 32 Helia aulopsis, Pfr Mon Helia, 1868, p. 93, Godwy-Austen (Macrochlamys), P Z S 1895, p. 446

Shell openly perforate, subumbilicate, depressedly conoid, lenticular, smooth, slightly polished, minutely decusated beneath a lens by transverse and rather distinct longitudinal lines both above and below, thin, translucent, greyish-brown horny, spire conoidal, suture very slightly impressed; whorks 5, gradually increasing, flatly convex above, the last sharply carriate at the periphery, moderately convex beneath, aperture oblique, quadrately lunate, subsecuriform; peristone thin, columellar margin slightly oblique, carried forward, and triangularly reflected above.

Major diam 12, min 10, alt 6 min

Hab South Audaman Island, not common

Animal light grey, mottled with a darker shade (Nevill) Right shell-lobe well developed Teeth on radula +20.8 1.8.20+ about.

205. Macrochlamys pseudaulopis, Gothem-Austen (Neull, MS), A M N H (6) 11, 1888, p 56, 2d. P Z S 1895, p 447

This is distinguished from M. autopis by rather smaller size, brighter and more rufous-brown colour, by the longitudinal (spiral) sculpture above and below being less strong, and fine and close instead of distant, by the suture being rather deeper, the whorls more convex, the last whorl less sharply keeled and more swollen beneath, the aperture higher in proportion to the breadth, and the columnlar margin vertical above and broadly reflected

Major diam. 10, min. 8, height 5 mm

Hab. South Andaman Island Common on Mount Harriet

Animal blackish throughout

206 Macrochlamys fordiana Godunn-Austen (Nevill, MS), A M N H (6) 11, 1888, p 55, 1d P Z S 1895, p. 446

Shell subobtectly perforate, depressedly conoid bluntly keeled,

thin, pale yellowish to rufescent horny, not polished above, more so beneath, transversely striated and with subobsolete rather distant longitudinal (spiral) lines, and obliquely somewhat closely irregularly and flexuously rugate above, faintly decussated and much smoother below; spire conoidal, the sides convex, apex obtuse, suture almost flat; whorls 5, flatly convex above, the last rather broader, bluntly angulate at the periphery, slightly tumid beneath; aperture oblique, subovately lunate; peristome thin, in one plane, columellar margin curved, scarcely vertical above and briefly but broadly reflected, partly concealing the perforation.

Major diam. 18, mm. 16, height 10 mm.

Hab South Andaman.

Distinguished by its peculiar wrinkled surface. By this young specimens may be separated from *M. pseudaulopis*, which they otherwise resemble

207. Macrochlamys ² perinconspicua, Godwin-Austen (Newll, MS), A M N H. (6) 11, 1888, p 57

Shell narrowly umbilicate, conoidly depressed, sublenticular, not very thin, slightly polished above, more brilliantly beneath, marked with fine, close, spiral or concentric (longitudinal) impressed lines above and below, brownish horny; spire conoidal, with the sides convex, apex obtuse, suture impressed; whorls 5, regularly increasing, convex, last whorl bluntly abgulate at periphery, convex beneath; aperture oblique, subangulately and broadly lunate, subovate; peristome straight, basal margin much rounded, columellar vertical, slightly reflected.

Major diam. 75, min. 7, height 4 mm. Smaller shells measure

 $6 \times 5 \times 3.5$ mm.

Hab Little Brother Island, Andaman group.

This is probably not a Macrochlamys.

208. Macrochlamys? battimalvensis, Godwin-Austen (Newll, MS), A M N. H (6) ii, 1888, p. 58.

Shell narrowly umbilicate, depressed, lenticular, compressedly carnate, not thun, smooth, finely transversely striated and decussated with microscopic rather distinct longitudinal impressed lines above and below, brownish yellow; spire low, conoidal, suture almost flat; whorls 4½, flatly convex, the last compressed above the prominent keel, more convex beneath, tunid around the deep pervious umbilicus; aperture oblique, subsecuriform; peristome thin (7 immature), straight, columellar margin vertical, rather broadly reflected.

Major diam. 95, min 8, height 4 mm.

Hab. Battı Malve, one of the Nicobar Islands.

This shell is not like any known Macrochlamys and the only specimen may be immature.

- G Species from Indian Peninsula and Ceylon, having Rajputana, Central India, and Chutia Nagpur on the north.
 - (Of the greater number the generic affinities are doubtful)
 - a Subglobosely depressed or subturbinate
 - a'. Longitudinal sculpture present (microscopical).
- Macrochlamys? tenuicula, H. Ad P Z S 1868, p. 14, pl. 14, fig 9; Pf. (Helix) Mon. Hel vii, 1876, p 94; H. & T (Helix) C I 1876, pl 89, figs 7, 10, Bif. J. A S B. 1880, 2, p 196, pl 2, fig 8

Nanna (Macrochlamys) effulgens, Nevill (Bif MS), Hand-1 1, 1878, p 26.

Nanina (Microcystis) tenuicola, Nevill, Hand-1 1, 1878, p 36; Peile (Microcystina), Jour Bom. N. H Soc 11, 1897, pp. 183, 262

Shell openly perforate, subumbilicate, turbinate, thin, yellow or fulvous horny, polished, transparent, striatulate, and under the microscope finely decussated on the upper whorls with minute, close, impressed spiral (longitudinal) lines, spire subconical, the sides slightly convex, apex obtuse, suture slightly impressed; whorls 5½-6, flatly convex above, rather closely wound, the last subangulate at the periphery (distinctly angulate in immature shells), convex beneath; aperture oblique, diagonal in the young, roundly lunate; peristome thin, straight, columellar margin much curved and nearly vertical above, turned back at the perforation.

Major diam. 9, min 8, height 7 mm.

Hab Bombay and the Western Ghats, Khandalla, Saltars, and, according to Nevill, Surat I obtained young specimens in the Bajpipla Hills at Dholgaum.

The animal is nearly black; foot very long and narrow; shell-lobes to mantle small, pointed; a large lobe above the mucous

pore.

This shell is easily recognized by its turbinate shape. The specimen originally described by H. Adams, 6 mm. in diameter, was immature. Some shells measure 10 mm. in major diameter. The young shell, however, with 4 whorls and the aperture diagonal and almost securiform, is thicker than older specimens and has all the appearance of an adult shell, the peristome being rather blunt.

b'. No longitudinal sculpture.

210 Macrochlamys fragilis, Hutton (Nanna), J A S B. 1838, p 216, Pfr (Helix) Mon Hel 1, 1847, p. 48, 1v, p. 80, Bens. Helix (Nanna), A M N H (2) ii, 1848, p 163

Shell openly perforate, subturbinately depressed, thin, polished, smooth, pale umber; spire conoidal, apex obtuse, suture impressed; whorls 4½, convex, the last broader and ventricose, obsoletely subangulate at the periphery (more angulate in young), rather flatly

convex beneath; aperture oblique, subquadrately lunate; peristome thin, columellar margin incurved, vertical and rather broadly reflected above.

Major diam 72, min 7, height 5 mm.

Hab. Kirmalliah, about 5 miles from Neemuch in Central India

(Hutton).

The original specimens were found crawling on Dhak or Palás (Butea frondosa), and it is not clear that they were mature. The description is taken from two immature specimens in the British Museum, presented by Capt Hutton. The diameter of Hutton's type was 0.35 in (9 mm). The species is allied to M tenuicula, but is more openly perforate and less angulate at the pheriphery, besides wanting the longitudinal sculpture of that shell.

211. Macrochlamys? lixa, Blf. Nanina (Macrochlamys?), J A S B 1866, 2, p 35, Pfr (Helix) Mon Hel v, 1868, p 79, H 3 T (Helix) C. I 1876, pl 149, figs 5, 6; Newtl (Nanina), Hand-l 1, 1878, p 26

Shell subobtectly perforate, depressedly turbinate. subglobose, very thin, above dull, without lustre, and, besides the ordinary striction, marked with fine, close, flexuous, transverse impressed lines under the microscope, polished beneath, olivaceous or fulvous with an olive tange; spire conoidal, suture impressed, wheris 6, convex, the last much broader, rounded at the periphery, turned beneath. Aperture oblique, large, roundly lunate, almost as high as broad; peristome thin, straight, columellar margin slightly oblique, nearly vertical above, reflected, not broadly but so as partly to cover the perforation.

Major diam. 16, min. 142, height 10 mm.

Hab. Orissa and Ganjam (Ball, Beddome) The locality originally given, Anaimalai Hills, appears to have been a mistake.

212. Macrochlamys? hebescens, Bif. Nanna (Macrochlamys), J. A & B 1866, 2, p 34, Pf: (Helix) Mon Hel v, 1868, p 78, H & T (Helix) C I 1876, pl. 149, fig 1, P Newll, Nanna (Macrochlamys), Hand-l 1, 1878, p 26

Shell scarcely perforate, conoidly depressed, yellowish or fulvous, thin, horny, dull (without lustre), marked with very close, microscopic, impressed, oblique (transverse, somewhat irregular and wavy) lines above, more polished and radiately striated below, spire low, apex rather acute, prominent, subacuminate, suture deep; whorls 5½, rounded, the first narrow, the last much broader, very bluntly subangulate at the periphery and tumid beneath, mouth large, nearly vertical, lunately subovate, breadth exceeding the height; peristome thin, straight, margins subdistant, united by a very thin callus, columellar margin nearly vertical above, very briefly and broadly reflexed, nearly covering the perforation

Major diam 15, min 12½, height 8½ min.

132 JONITIDE

Hab. Jeypore, Vizagapatam The locality originally given, Anaimalai Hills, is erroneous, as in the case of M. infausta and M. lixa

This may perhaps be a variety of M hea, with a lower spire.

213 Macrochlamys pedina, Bs. (Helix) A M N H. (3) xv, 1865, p 13, Pf. (Helix) Mon Hel v, 1868, p 100, 1d vii, 1876, pp 108, 530, H & T C I 1876, pl 51, fig 3, Stol J A S B 1872, 2, p 212, footnote, Godwin-Austen, Mol Ind 1, 1898, pl. 21, fig 13 (sculptine of inner whorls), 1d ii, 1907, pp 87, 133, pl 83 (mintomy), Perle (Nauma), Jour Bom N H Soc 21, 1897, p 133, Kobelt, Nanna (Xestina), Mart & Chema Syst. Conch-Cab, Zonitado, 1901, p 980, pl 254, figs 4, 5, 1d (Macrochlamys) t c 1901, p 1021, pl 263, fig 2

Helix vitinoides, Pf. (pt), Mart & Chema (nec Desh) Syst Conch-Cab. 1901, pl 110, figs 10-12 (nec 13-15).

Shell rather openly perforate, considly depressed, very thin, translucent, polished below, less so above, smooth, without longitudinal sculpture, but minutely, closely, and flexuously strated, transversely on some of the inner whorls, yellowish to fulvous horny, spire very low, but varying in height, suture impressed; whoils 6½, slightly convex above, the last broader, bluntly subangulate above the periphery, somewhat tumid beneath; aperture slightly oblique, roundly lunate, peristome very thin, columellar margin much curved, vertical and reflected above, partly covering the perforation

Major diam 30, min 25½, height 13½ mm Other specimens

measure 30, 261, and 151, and 28, 23, and 13.

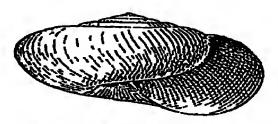


Fig 50 -Mucrochlamys pedina

Hab A considerable part of the Bombay Presidency Common at Bombay and Khandalla, and reported from Cutch (Stoliczka), Poona, Singhar (W T B), Ahmednagar, and South Canara (Biddome) The South Canara shell has a higher spire. A very similar form, perhaps a variety, is found at Karnul (Beddome)

Animal pale to dark grey or blackish in colour; shell-lobes well developed, right dorsal lobe ample, left dorsal lobes in two parts. Teeth in radula of usual form 44 3.14.1 14 3 44(61.1.61) The genitalia differ from those of typical Macrochlamys by the excum of the male organ not being coiled, [thus resembling much

more that of Amophanta]. The spermatheca is very long and the dart-sac long and cylindrical.

This is the largest Indian peninsular species.

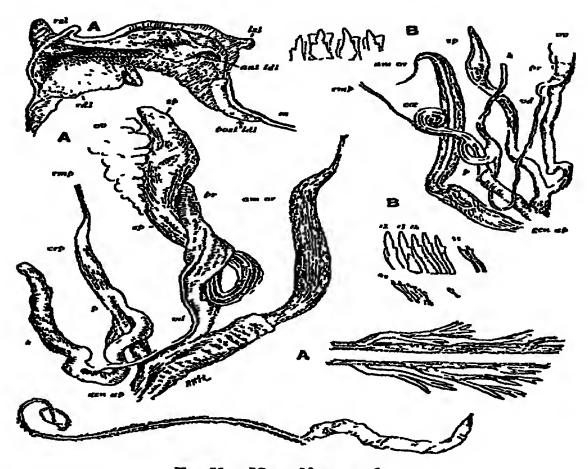


Fig 51 -Macrochlamys pedina

A Mantle-edges, showing shell- and dorsal lobes ×3
Genitalia. ×3
Spermatophore ×3 4
Ditto, portion of flume of ×22 5

Macrochlamys hardwickin

B Genitalia Enlarged about 3 times Teeth of the radula

214. Macrochlamys infausta, Blf Namma (Macrochlamys), J A & B 1860, 2, p 36, Pf. (Helix) Mon Hel v, 1868, p 124, H & T (Helix) C I 1876, pl 159, figs 2, 3

Shell openly perforate, subumbilicated, conoidly depressed, subglobose, thin, translucent, with a dull greasy lustre above, glassy below, brownish tawny; sculpture as in M. hardwickii, the longitudinal strice very close and minute, only visible under a strong lens; spire low, conoidal, suture impressed; whorls 6, convex above, the last rather broader, rounded at the periphery, tumid beneath, aperture oblique, roundly, lunate, margins converging; peristome thin, basal margin subarculate, columellar margin much curved, vertical above and rather broadly triangularly expanded and carried forward, not reflected.

Major diam. 22, min. 20, height 14 Larger specimens mea-

sured $24\frac{1}{2} \times 22\frac{1}{2} \times 14\frac{1}{2}$ and $26 \times 28\frac{1}{2} \times 14\frac{1}{2}$.

Hab. Russelconda, Northern Circais, Madras Presidency (Trail), Golconda Hills, Ganjam and Jaipur (Beddome), not Anaimalais.

This resembles M hardwicker in form and sculpture, but is much larger and has a more open umbilicus. It is distinguished from M indica, M. petrosa, and M perplana by more globose form and by sculpture. It differs from M pedina in smaller size, different sculpture, sounder periphery, and more open perforation. The expanded portion of the columellar margin, viewed from beneath, is carried forward almost at right angles to the direction of the basal margin.

The locality originally assigned to this species, the Anaimalai Hills, appears to have been given in error, as in the case of

M. haa.

b. Dem essed or conordly depressed.

d. Diameter not exceeding about 15 min. (May possibly belong to Eurychlamys.)

215. Macrochlamys? umbrina, Pf. (Helix) Mon Hel iv, 1859, p 49, H & T. (Helix) C 1. 1870, pl 89, figs 1, 2, 3

Shell scarcely perforate, conoidly depressed, thin, translucent, polished, very finely and closely striated spirally (longitudinally) beneath the microscope, brownish tawny, spire low, conoid, auture impressed, whoils 4½, convex, the last broader, rounded at periphery, flatly convex beneath, sunken around the perforation, aperture slightly oblique, lunate, peristome thin, straight, columellar margin oblique, reflected above, almost concealing the perforation.

Major diam. 8, min 7, height 4½ mm Hab Ceylon, Badulla district (Layard).

216. Macrochlamys? nepas, Pf: (Helix) P Z S 1855, p 01, id. (Helix) Mon Hel iv, 1859, p 24, H. & T (Helix) C. I. 1876, pl. 182, figs 1, 2

Shell narrowly perforate, conoidly depressed, thin, smooth, polished, finely and closely strinted spirally (longitudinally) beneath the microscope, orange-brown, spire conoid, suture impressed, whorls 4½, convex, the last broader, rounded at the periphery, turned at base, aperture subvertical, roundly lunate,

peristome thin, straight, columellar margin curved, vertical above and expanded, narrowly reflected.

Major diam 71, min 61, height 5 mm.

Hab. Ceylon

The above description is taken from the typical specimens in the British Museum, but they differ somewhat in colour and in the shape of the mouth from Pfeiffer's original description. He described the shell as purplish brown, and the aperture as broadly lunate.

217. Macrochlamys? woodiana, Pfr (Helix) P. Z S 1851, p 254, id (Helix) Mon Hel 111, 1858, p. 87, H & T. (Helix) C I 1876, pl. 32, figs. 2, 8, Nevill, Jour. Conchyl xxvi, 1878, p 60, id Hand-l 1, 1878, p 22 Helix carneola, Pf. P. Z S 1854, p 148, id. Mon Hel iv, 1850, p. 47, H & T C I 1876, pl 128, figs. 2, 3.

Helix semifusca, apud Pfr. Mon Hel 1v, 1859, p 62, pt . nec Deshayes, vide Nevill, t c

Shell very narrowly umbilicated, depressed, thin, smooth, glassy, yellowish to fulvous horny, with very fine indistinct spiral striction only visible when highly magnified; spire low, conoidal, apex rather prominent, suture well impressed; whorls 6, convex increasing slowly, the last scarcely broader, bluntly subangulate at periphery, flatly convex below; aperture oblique, broadly lunate; peristome thin, basal margin slightly arcuate, columellar curved, oblique, not reflected over the umbilicus, but carried forward for a short distance.

Major diam. 12, min 11, height 51 mm.

Hab. Ceylon and Southern India, Trichinopoly, Kolamalai Hills, Arcot (W. T B); Myhendra, Travancore (Beddome).

A common species in the Carnatic and, apparently, in Ceylon. Nevill has shown that the true Helir semifusca of Deshayes, supposed to have been brought from Pondicherry, really came from Mauritius At the same time the shell described by Pfeiffer is different from woodiana, as Nevill shows. The types of H woodsana and H. carneola in the British Museum appear to me identical.

218. Macrochlamys? rutila, Bif. P. Z S 1904, 11. p 443, pl. 25, fig 11.

Shell perforate, depressed, glassy, polished, closely, minutely and regularly striated longitudinally (spirally) under the microscope above and below, light chestnut; spire very low, suture slightly impressed, whorls b, convex, the last broader, rounded at the periphery, convex beneath; aperture slightly oblique, lunate; peristome thin, upper margin slightly arcuste, basal nearly straight, columellar oblique, briefly and triangularly reflected above.

Major diam scarcely 15, min. 13, height 6 mm. Hab. Anagundi Shola, Anaimalni Hills (Beddonie).

- c. Upper surface transversely plicate or ribbed.
- 224. Macrochlamys? peringundensis, Bedd. P. Z. S 1891, p. 818, pl 29, figs. 13, 14

Shell minutely and subobtectly perforate, depressed, sublenticular, thin, translucent, polished, greenish horny, rather irregularly and obliquely plicately striated above, smooth beneath, very minutely (microscopically) sculptured longitudinally above and below with fine, close, papillose, irregular lines; spire low, conoidal, the height above the periphery less than that below, suture scarcely impressed, whorls 5½, flattened above, the last broader, sharply angulate at the periphery, swollen below, aperture oblique, angulately lunate; peristome thin, straight, columellar margin curved, vertical and reflected above.

Major diam. 16, min. 13½, height 8 mm. Hab Peringunda Hill, Anaimalais, 5000'.

Apparently an ally of *M. phofera*, with similar microscopical sculpture, but distinguished by the plications not passing over the periphery and by other characters Animal not known.

- d Shells not exceeding about 6 mm (\frac{1}{4} inch) in diameter.

 (Generic affinities doubtful.)
 - a. Depressed or considly depressed.

b. Smooth.

225. Macrochlamys? perfucata, Bs (Helix) A M N. H (2) xii, 1853, p 93, Pfr (Ilelix) Mon Hel iv, 1859, p. 50

"Shell scarcely perforate, depressed, translucent, purplish brown, highly polished, spire slightly raised, suture submarginate, apex obtuse, whorls 4, rather convex, closely wound, the last rounded, convex beneath; aperture lunate, scarcely oblique, peristome straight, sharp, columellar margin vertical, gently reflected, umbilious not pervious.

"Major diam 5, min. 3, axis 3 mm." (Benson in Latin)

Hab. in the district of Galle, Ceylon (Layard).

I do not think the Microcystina from Bintenne and Matale (1800-2000'), north of the mountain complex in South-western Ceylon, can be the same as this species from Galle on the south coast, although referred to it by Godwin-Austen (Mol. Ind. 11, p 110, pl 92, fig 4). It is quite possible that Benson's type, now no longer available, may have been immature, but the differences, especially in the character of the aperture, are too great to be attributed to age alone

- 226. Macrochlamys? tratanensis, Jousseaume (Vitrea), Mém Soc Zool &r vii, 1804, p 270, pl 4, fig 11
- "Shell scarcely perforate, lenticular, depressed, thin, smooth, diaphanous, yellowish glassy, polished above, below obscurely and

radiately structed; spire scarcely raised, suture linear; whorls 4, depressed, convex, the last but little broader at the base, not descending; aperture nearly vertical, roundly semilunar; peristome simple, acute, thin, fragile, columellar margin reflected below and almost concealing the small umbilicus

"Major diam 5, min 4, height 2 mm." (Jousseaume in Latin.)

Hab. Nuwara Ellia, Ceylon.

Probably not adult. The periphery is rounded, not angulate. Only two specimens were obtained. This might perhaps be M. perfucata, but as it inhabits the higher mountains of Ceylon it is not safe to identify it with a species living near the sealevel

b'. Longitudinally striated

227. Macrochlamys 2 kandiensis, Godwin-Austen (Nevill, MS.), Mol Ind 1, 1883, p 90, pl 14, fig 2

Shell perforate, conoidly depressed, rather solid, dark chestnutbrown, polished, finely, rather distantly striated longitudinally beneath the microscope above and below, spire low, convexly conoidal, apex obtuse, suture shallow, whorls 5, convex, the last well rounded at the periphery and moderately convex beneath; aperture slightly oblique, rather broadly lunate; penistome thin, columellar margin oblique, slightly curved and expanded, more reflected above

Major diam. 3½, min. 3, height 2 mm.

Hab. Kandy, Ceylon.

228. Macrochlamys? neherensis, Bs (Helix) A M N. H (3) viii, 1864, p 210 Pfr. (Helix) Mon. Hel v, 1868, p. 164, H & T (Helix) C I. 1876, pl 32, figs. 5, 6, Nev. Nanina (Microcystis), Hand-l 1, 1878, p 38

"Shell narrowly and deeply (perspectively) umbilicate, depressed, obliquely structulate, decussated above and below with very close spiral or concentric impressed lines, spire slightly convex, apex flattened, suture marginate, subcanaliculate; whorls 5, slightly convex, the last rounded at the periphery, convex beneath, excavated round the umbilious; aperture oblique, broadly lunate, peristome thin, straight (in one plane), the margins joined by a thin minutely granulate callus; columellar margin subvertical. short, slightly reflexed.

"Major diam 5, min 4, axis 2 mm" (Benson in Latin.)

Hab. Mahableshwar and Khandalia (Fairbank)
The description is a translation of Benson's Latin one, except that I have omitted the term lenticular. I had specimens of this shell, but they have been crushed.

140

229. Macrochlamys? atoma, Blf. (Fairbank, MS.) P. Z. S 1904, ii, p. 443, pl. 25, fig. 6

Shell openly perforate, depressed, discoidal, rather solid, smooth, glassy, longitudinally (spirally) striated above and beneath under the microscope with regular, parallel, subdistant, impressed lines, whitish horny; spire very low, almost flat, suture impressed; whorls 3½, regularly increasing, convex above, the last not descending, rounded at the periphery, flatly convex beneath; aperture slightly oblique, lunate; peristome thin, upper and basal margins moderately arcunte, columellar margin very oblique, almost horizontal, not reflected.

Major diam. 1.5, min 12, height 0.6 mm.

Hab. Godavan Valley. I have obtained specimens from Paitan near Ahmednagar to below the first barrier at Dumagudlon, also in the Wardha and Penganga valleys. Found commonly with other shells amongst the débris deposited by river-floods and marking their highest level. I believe I also obtained this shell in the Nerbudda Valley. All specimens obtained were dead and usually milky white.

[Appendix to MACROCHLAMYS

No. 116 (p. 79). Macrochiamys vesicula, Bs, should be, vesicula, Hutton.

It is impossible now to ascertain on what shell Mr. Benson based his first description of this species; he believed it had a wide geographical range. Unfortunately, the exact locality of the shell Dr. Blanford has described is not specified, nor is it now to be found among his shells. The Murree specimens (p. 79) are distinct.

The H. vesicula of Hutton, 1837, was certainly Himalayan; he speaks of it as occurring from Monee Marjora, on edge of the plains, to Simla and the forest of Mahasu, 10,000 feet. He and Benson gave it an even greater range, as Dr. Blanford explains, p. 80. Thus it was that in 1852, fifteen years later, we find him giving an amended description of a shell he found at Soti Durga, at head of the Gangetic Delta, under the name H vesicula. The typical specimens are in the McAndrew Collection at Cambridge, and now before me, marked Himalaya, but it is not the original label, these were all destroyed, and fresh substituted by McAndrew. These shells are unmistakably from Lower Bengal, and I can see nothing to distinguish them from M subjecta of Raymahal.

The two species from between Neemuch and Mhow, recorded by Captain Hutton as Nos 28 & 29, J A S B 1834, pp 520-21, and of which he gives descriptions of the animals (sufficiently good to distinguish them when some one finds them again), cannot

possibly be the same as the Himalayan *H. vesicula*. Hutton, was a very accurate observer, noticed the difference but them: he says "they have no tentacular processes on the side, no fleshy hook on the tail" No. 3 Helix of a previpaper in same Journal, February 1834, p. 83, was a Macrochla and is now known as M. petrosa. "shell is like No. 29, but more polished"

No 192 (p. 121) Macrochlamys andersoniana, Nevill

Nanina honesta, var andersoniana, Nevill, J A S. B. 1877, p. 16, id Yunnan Ecped, Mol 1879, p 874
Nanina (Macrochlamys) honesta, var andersoni, Reese, Conch. pl 84, ng 452 (as H honesta), Nev. Hand-list, 1, 1878, p. 24.

Original description — "This variety is distinguished (typical honesta) by its less depressed shape, it is scarcely if at angled at the periphery (the angulation being very distinct in type form), the peristome not being so broadly reflected over perforation, the substance and texture, perforation, shape of aperture, and number of whorls are identical"

Type of var. andersomana from Ponsee (J. Anderson).

Diam. 11, axis $6\frac{1}{4}$, apert. alt. 4, diam. $5\frac{1}{4}$ mm.

Nevill records. Hab. Thyetmyo, Sibsagur, Naga and Kh Hills, Chittagong and East Cachar, Dafia Hills, &c I can accept his Upper Burmah localities Pudupyoo, 2nd Defile Irrawa Nandin, and Ava. Specimens from Bhamo (Anderson) in collection do not agree with the Assam shells, and I doubt identification. many of the shells having been collected by and known to me. The description of the Bhamo shell is as follows:—

Shell globosely and depressedly conoid, narrowly umbilicated, rather solid; sculpture very smooth and glossy, longitudinal microstriation; colour pale horny with a greenish tinge; spire moderately high, slightly convex, suture adpressed, whorls 4½, sides above convex and well rounded on the periphery, the last slightly descending; aperture oblique, broadly lunate; peristome slightly thickened, straight, reflected considerably over the perforation.

Size major diam 103, minor diam. 8.5; alt. axis 50, alt body whorl 40 mm.

Having examined the animal of *M honesta* from Moolayit, Tenasserim, I have found considerable differences between it and *M. ander somana*, especially in the radula; this last I consider a good species. It was apparently this species, or one very like it, which Stoliczka described in the Journ. Asiat Soc Bengal, 1871, at the bottom of pp. 249–250, with the figures on pl. xvii. of teeth of the radula, fig. 14, and the spermatophore, fig. 13.

No 157. Macrochlamys beata, Godwin-Austen.

Teeth of radula are figured on p. 126, fig. 49 E.]

[Key to Species of Euplecta

A Shell turbinate or subturbinate, thin, horny, finely decussated above	layardı subdecussalç bacom acalles pulchella
B Depressedly turbinate, or turbinate or lenticular, generally sharply keeled, with granular costulation or striction on upper surface	semidecussala sosamonda. subcastor travancos tea tudtea albizonata emihana læi is binoyaensis verrucula fluctuosa mestoni scobinoides gardeneri.
C Globosely concid or depressed, with rounded peri- phery.	subopaca partita tremeni
D Conoidly depressed and carrante	acuducta rsabellma collettr.
E Trochiform.	
" Sculpture granular	cacumunifera
b Sculpture finely decussated	granulifesa hyphasma turritella
c Smooth	mucronifera phidias. concarospira apicala oi biales
F Depressedly turbinate	
Finely decussate	mucosa]

[Key to Species of Macrochlamys.

A Species from Himalayas west of Nepal.	_
a Subglobose or subglobosely depressed, not labinte.	vesıcula
	glauca
	nuda ·
	Luluensis
B Species from Eastern Himalayas (Sikhim and	1-10-11-11-11-11
Western Bhutan)	
a. Labiate	tugurum
	mainwaringi
	dalmgensu
	opipai a
	damsangensis
6 Not labiate	
a' Subturbinate	hodgsoni
b' Depressed	nougeons
a ² . Spirally (longitudinally) sculptured .	20045
a Spinning (tongitudinally) actuation	sequar.
	ક લ્વુ ાંપક
	superflua
	r akaensıs
b^2 . Smooth	lubrica
a ³ . Conoidly depressed, rugose transverse	
(but no longitudinal) sculpture	patane
	perfragilis
c With free cocum to male organ	richilaensis.
3	sathilaensis
	remoensis
d Shells not exceeding 6 mm	20110011010
6. Longitudinally striated or sculptured .	7 .
5. Smooth	orida
	duryilingensis
C Species from the Gangetic Valley and Delta, the N. W Provinces, and Bengal with Raymahal Hills	
a Depressed or conoidly depressed	ındıca
a' Longitudinal flexuous impressed sculpture	
a Longitudinai nexuous impressed scuipture	petrosa (type) hardwichu.
b'. Very fine microscopic striæ	
b Smooth	subjecta
	lecythis
	perplana
D Species from the Assam Hills, North and South of Valley.	
a Labrate	atricolor.
	castaneo-labrata
	hepatizon
A Not labore	lata
b. Not labrate	decussata
	<i>Unotaensis</i>
• •	rubellocincta
	bilineata
	uda
	cacharıca
	salmonea
	godwine.
	termmes.

a'. Shell globose	
b' Strongly or microscopically stricto longitu-	
dually	beata munipurensi
	fragosus.
a' Shell depressedly conoid	ji ugosus.
b". Smooth	mahadeoensi
	hengdanensis
	r azamiensis
	lahupaensis
	hooker i
c Upper surface transversely plicate or ribbed .	plicifei a
Zaman a managaran a	shisha
d Shells not exceeding about 6 mm (a quarter	
inch) in diameter (Generic affinities often doubtful)	_
a Subglobose or subturbunate	
b Smooth	nengloensis.
	kolinensis ruberti
	tann ensis
b' Longitudinally striated!	longicauda
	dor anr
	or rgmaria
	umbraticola
a'. Depressed or conordly depressed.	
b" Longitudinally striated	sata _
	parata
To Common from Danner And on and Tomorrows	rusticula
E Species from Burma, Arakan, and Tenasserim a Peristome labrate	consepta
a' Smooth	petasus
te Dirigonit	aspides
b Peristome not labiate	chaos
a". Longitudinally (spirally) stricted	Lumahensis.
	causia
6' Subglobosely depressed	
a'''. Smooth	salwnensis.
	dugastı
b". Depressed or conordly depressed	
δ ^m Smooth	subpelasus
54. Longitudinally stricted	nozra nebulosa
o. Dongitudinany acrated	notha
	hypoleuca
	spi eta
	patens
c Shells not exceeding 6 mm.	
a' Turbinate	րսոցւ
b' Depressed or conoidly depressed	
a" Smooth	molecula
	curvilabris
b" Longitudinally stricted	perpaula
•	paterilula

F Species from Andaman and other Islands in Bay of Bengal a Depressed choinix pseudochomii exul stephus woodmasoni b Depressedly conoid, more or less lenticular aulopis. pseudaulopis. fordiana permeonspicua. battımalvensıs G Species from Indian Peninsula and Ceylon. a Subglobosely depressed or subturbinate. a' Longitudinal sculpture present (microscopical).
b' No longitudinal sculpture tenurcula fragilis lıza. hebescens. pedma infausta b Depressed or conoidly depressed a' Diameter not exceeding about 15 mm. umbrina nepas woodrana rutila vallicola todarum perrottetz, prava vilipensa. c Upper surface transversely plicate or ribbed peringundensis d Shells not exceeding about 6 mm (1 inch) m diameter a Depressed or conoidly depressed 5. Smooth per fucata tratanensis b' Longitudinally striated Landrensis. neherensis atoma 7

Genus PARVATELLA, nov.

Type, P. flemingi, Pfr.

Range. Western Himalayas of Kashmir.

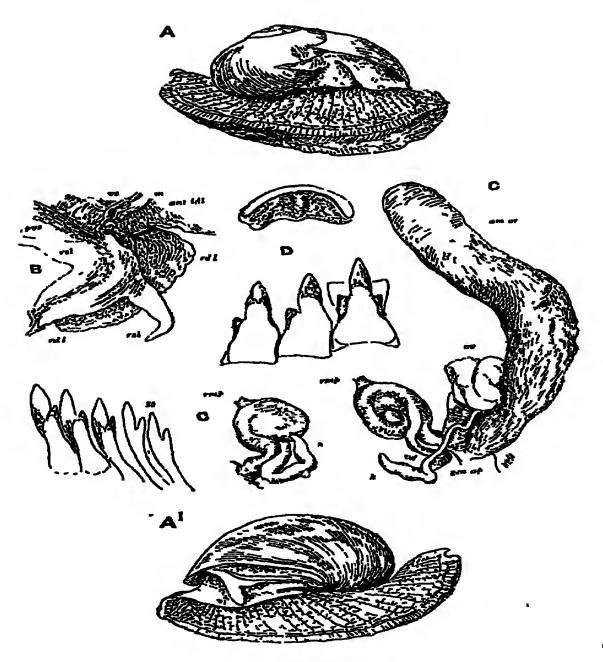
Shell imperforate and with few whorls, rapidly increasing, as in Vitrina. Mouth very oblique and large. Usually a thick oliva-

ceous epidermis

Animal with elongate tongue-shaped shell-lobes, broader than in *Macrochlamys*, and a pointed lobe above the large mucous pore at the posterior termination of the foot. The male organ has a peculiar disk-like coil, as in *Oxytes orobia* and in typical forms of *Macrochlamys*, to which the retractor muscle is attached.

This genus has the animal of Macrochlamys, with a Vitrina-like

shell.



[Fig 53 -Parvatella flemings

- A, A' Animal, drawn from specimen preserved in spirit. View of right and left sides. Natural size.

 B The right shell-lobe and right dorsal lobe. ×3.
 C Part of the genitalia penis from both sides and amaterial organ. ×3 and 55.
 D Jaw and teeth of the radula. ×255.]

230. Parvatella fiemingi, Pfr (Vitrina) P Z S 1856, p 324, id (Vitrina) Nov Conch 1, p 99, pl 28, figs 1-3, id (Vitrina) Mon Hel 1v, 1859, p 790, v, 1868, p 14, Nevill (Helicarion), I ark. Miss, Mol 1878, p 14, id (Helicarion) Hand-l i, 1878, p 15, Theobald (Helicarion), J A S B. 1878, 2, p 143; id (Helicarion) op cit 1881, 2, p 45, Godwin-Austen (Macrochlamys), Mol Ind 1 1888, p 212, pl 54, figs 1-1 e (animal and shell); 11, 1899, p 133, pl 87, figs 2-2 d (spermatophore), [Cockerell, Pseudovitrine, sect Helicarionine, type Macrochlamys flemingi, Pfr A M N H (6) vii, 1891 (sine desc.)]
Helicarion austemanus, Theob J A S B 1881, p 45, nec Newll

Shell imperforate (sometimes apparently subperforate behind the columellar callus), depressedly globose, thin, opaque, not polished, having an olivaceous rather silky epidermis, and sculptured with plicate transverse strike of growth, and with very close, minute, longitudinal (spiral) lines, not always easily detected; spire subconoidly convex, apex blunt, suture moderately impressed; whorks 5, convex, somewhat flattened above, the last large, rounded at periphery and swollen beneath, base smoother; aperture diagonal, lunately oval, having a pearly lustre within; peristome with the epidermis projecting beyond the shell, margins converging, arcuately dilated between upper and outer margin, columellar deeply curved, meeting penultimate whorl at an obtuse angle, reflexed above, forming a callus

Major diam 32, min. 24, height 17 mm. Some shells measure

as much as $42 \times 31 \times 20$.

Hab The ranges around Mari and in Hazára; common at Tandiani (Theobald) The original locality was by some error given as "Scind"; but the box in the British Museum is marked "collected 10,000 feet above the sea on the Murri Hills, N Punjab" Whether P. flemings is found east of the Jhelum River is not known.

The animal differs from other Vitrina-like mollusca and much resembles Macrochlamys. The shell-lobes of the mantle are long and pointed; the mucous pore is large, with a distinct overhanging lobe. In the generative organs the male organ is attached to the retractor muscle by a disk-like coil, as in Oxytes orobia and most species of Macrochlamys. Dart-sac large, spermatheca well developed, and a rather large kalc-sac. The teeth on the radula are thus arranged 62 3.24.1.24 3.62 (89.1.89); central tooth tricuspid, those on each side of it bicuspid; outermost laterals very minute, bicuspid.

231. Parvatella magnifica, Rv (Vitrina) Conch Icon, 1862, Vitrina, sp 17

Shell depressed, thun, covered with a thin olivaceous epidermis, marked with transverse strike of growth and with fine subobsolete spiral lines, scarcely polished above, more so beneath; spire low, convex, suture impressed, whorls 4½, flatly convex above, the last not descending, rounded at periphery and beneath, aperture oblique, lunately oval, peristome thin, margins converging, upper

ь2

arcuately dilated at junction with right margin, columellar curved, nearly vertical, slightly directed to right, where it meets penultimate whorl, and forming a small callus

Major diam 281, min 21, height 131 mm.

Hab. Not clearly ascertained, but probably Punjab Hills One specimen marked "Scind," which is not likely.

232. Parvatella altıvaga, Godinin-Austen (Macrochlamys), Mol Ind.
1, 1888, p 213, pl 14, fig 2
Helicarion flemingi, var altıvagus, Theob J A S B 1878, 2, p 143.

Shell depressed, thin, translucent, not polished, transversely plicately marked with lines of growth, crossed by traces of fine close longitudinal (spiral) lines, olive-brownish, spire nearly or quite flat, suture very slightly impressed; whorls 5, flat above, last much broader, not descending, rounded at periphery, aperture oblique, lunately oval; peristome simple, margins converging, columellar terminating above in a reversed callus

Major diam 30, min. 23, height 13 mm. Hab. Uri in the Jhelum Valley, Kashmir.

A much thinner and flatter shell than P flemings, and rather flatter than P. magnifica

233. Parvatella austeniana, Nevill (Helicarion), Yark Muss, Mol 1878, p 14, figs 22, 24, id Hand-l 1, 1878, p 15, Godwin-Austen, Mol. Ind 1, 1888, p 215, pl 54, figs 4, 4a, 4b (shell) (nec Thiob J A S B 1881, p 45)

Macrochlamys cassida, Godwin-Austen, Mol Ind 1, 1888, p 214, pl 54, figs. 3, 3 a (shell)

Shell depressedly globose, moderately thin, covered with a thick dark olive epidermis, slightly polished, plicately striated transversely, without longitudinal striation; spire convexly conoid, apex obtuse, suture impressed, whorls 5, convex, the last large, but less broad than in other allied forms, descending in front, rounded at periphery, swollen beneath; aperture almost circular, lunate, higher than broad, diagonal; peristome simple, the epidermis extending slightly beyond the shell, margins converging, arcuate at upper portion of right margin, columeliar lip regularly curved and meeting the penultimate whorl at an open obtuse angle, the upper portion with an appressed callus.

Major diam 30, min. 24, height 19 mm

Hab Small specimens measuring 15 mm in major diameter were described from Sonamarg, in Kashmir, by Nevill. In Godwin-Austen's collection is a much larger shell from Uri, Jhelum Valley, of which the dimensions are given above.

[Genus EUAUSTENIA.

Euaustenia, section of Austenia, Cocherell, A M N H (6) vii, 1891, p 98 (sine desc), Nautilus, vii, 1898, p. 10.

Shell differs from that of Austema gigas in being more heliciform,

shelly, and thin. The animal has large leaf-like right and left shell-lobes, which in life nearly cover the whole of the shell. In the genitalia the penis has a coiled cæcum near the retractor muscle, and is thus similar to Macrochlamys

Range The Western Himalaya to Sikhim, and as far west as

the Kuram Valley, Trans-Indus.

234. Euaustenia monticola, Pfr (Vitrina) P Z S 1848, p 107, ed (Vitrina) Mon Hel 11, 1848, p 497, Theobald (Helicarion), J A S B 1878, 2, p 143, Nevill (Helicarion), Yark Miss, Mol 1878, p 15, ed (Helicarion) Hand-l 1, 1878, p 15 nec Reeve, nec H.&T., nec G.-A

Vitrina scutella, Bs A M N H (3) iii, 1859, p 188, partim, Pfr Mon Hel iv, 1859, p 498, Rv Conch Icon fig 13, H & T C I 1876, pl 66, figs 1-4, Godwin-Austen (Austema), Mol Ind 1, 1888, p 232, pl 52, figs 1-1e [shell and animal of the Murree form], Cockerell, Euaustemie (section of Austenia), A M N H (6) vii, 1891, p 98 (sine desc), id Nautilus, xii, 1898, p 10 P Austemia serahanensis, Godwin-Austen, Mol Ind i, 1888, p 237,

pl 54, fig 4.

Shell depressed, thin, pellucid, very faintly striated, smooth, polished, yellowish horny; spire flat, apex very slightly prominent, suture impressed, whorls 4, rapidly increasing, flattened above, the last not descending, rounded at periphery, moderately tumid beneath, flattened towards mouth, aperture oblique, ovately lunate; peristome thin, margins converging, the upper straight near the last whorl, then arcuate near right margin, columellar sinuate, forming a rounded obtuse angle with basal margin.

Major diam 18, min. 13, height 7 mm.

Hab North-west Himalayas eastward to Nami Tal

The animal (of A scutella from Murree) [which I consider distinct from monticola of Mussoorie] has well-developed dorsal and shell-lobes to the mantle, [and these are quite plain and unmottled] The posterior portion of the foot is very long and sharply keeled above The odontophore bears the following teeth:

30.2.14.1.14 2.30 (46 1.46)

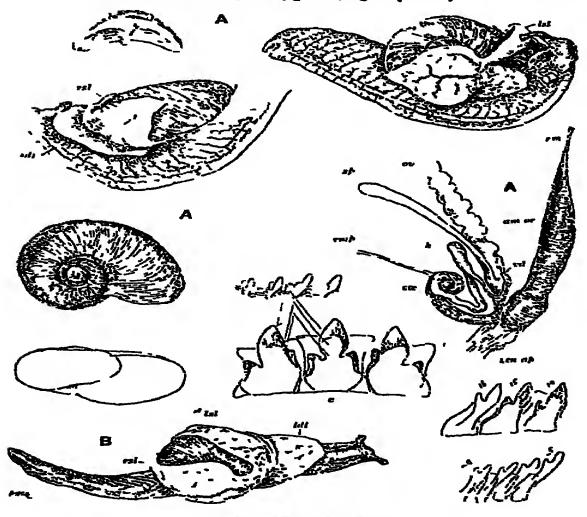
Pfeiffer described this shell from one of three specimens, all smooth, translucent, and depressed shells, still in the British Museum. Reeve figured a much more globose form, also in the Museum, with a raised spire and different sculpture (apparently E. cassida, Bs) Hanley again figured apparently the same species, and Godwin-Austen, misled by Hutton, as pointed out by Nevill, has done the same. Theobald also recognized the true monticola, which he had received from Benson Scutella was named from two different shells, one from Kashmir (Nasmana on the Chandrabhaga River), the other said to be from Teria Ghat in the Khasi Hılls The last is an obscure form not recognized The Kashmir form differs slightly from E monticola in having its mouth even more lengthened, but it is doubtful whether this is constant. I regard the two as identical.

235. Euaustenia cassida, Hulton, J. A. S. B. vii, 1838, p. 214, Pf. (Vitrina) Mon. Hel. ii, 1848, p. 497, iii, 1853, p. 2, Rv (Vitrina) Conch. Icon., Vitrina, fig. 10, H. & T. (Vitrina) C. I. 1876, pl. 152, figs. 2, 3, Nev. Hand-I. i, 1878, p. 15, Theobald, J. A. S. B. 1878, 2, p. 14, Godwin-Austen (Austenia), Mol. Ind. i, 1888, p. 214, pl. 54, figs. 3, 3 a. (shell) [is a large Parcatella custeniana]

Vitrina monticola, Rv Conch Ic, Vitrina, fig 11, H & T C I 1876, pl 152, fig 1, Godwin-Austen (Austenia), Mol Ind 1,

1888, p 234, pl 52, bg 2

Helicarion stoliczkanus, Nevill, Fark Muss. Mol p 15, figs 19-21, Theobald, J.A. S. B 1881, p 45, Godioin-Austen (Austema), Mol Ind. 1, 1888, p 236, pl 52, tig 3 (shel)



[Fig 54 - Enaustenia cassida

A Animal, drawn from a spirit-specimen, viewed from both the right and left side, ×25, in the first the left shell-lobe is shown contracted and rolled up. The genitalia, ×45, jaw, ×12, teeth of the radula, ×868, and shell, ×25

Enaustenia storiczkanus

B Animal looked at from above, ×25 Specimen from Nami Tal]

Shell ovately depressed, thin, translucent, polished when young, less so when older, faintly striated, sometimes more densely, pale horny, spire convex, suture impressed; whorls 4½, convex, the last ascending very slightly towards the peristome, rounded at periphery, turned beneath, aperture oblique, ovately lunate, peristome thin, margins converging, upper margin straight at first near penultimate whorl, then arcuate, columellar sinuate, meeting last whorl at an obtuse angle.

Major diam. 23½, min 18, height 11 mm (much larger specimens occur, one of the largest measuring $30 \times 23 \times 13$, another

 $26\frac{1}{2} \times 20 \times 12$).

Hab The Western Himalayas to Kumaun.

The type of cassida appears to be from Simla, that of stolicz-kanus from Almorah in Kumaun. It is possible that there are two distinguishable forms; but as stoliczkanus is quoted by Nevill from both Kashmir and Nami Tal, whilst the type of cassida is from Simla between the two, it is most likely that all are varieties, as was suggested by Nevill. The type of stoliczkanus measured

major diam. 22, height 13 mm.

The animal of cassida was described by Hutton [from Simla] as sometimes pale brownish, at others dark grey; [the shell-lobes in both are speckled and the right has a central vein-like dark streak]. "Two broad leaf-like processes, running to a point, are spread over the shell when the animal is in motion, so as entirely to conceal it, and presenting the appearance of a large grey slug with a hump-back; a fleshy anal horn, as in the genus Nanna" Tholast, of course, refers to the lobe above the mucous pore

[Formula of a Sunla specimen: 33.2.13.1 13.2.33

(48.1.48).

236. Euaustenia gurhwalensis, Godwin-Austen (Austenia), Mol Ind ii, 1899, p 108, pl 91, figs 1-1 h (shell, radula, &c)

This is very similar to *E cassida*, of which it may be a variety, but it is distinguished by fine microscopic longitudinal spiral striction crossing the plicate ridges of growth. It is more closely wound, the last whorl being narrower, and the mouth higher in proportion to its width; but as only a single specimen is available for examination, these differences may be more or less of an individual character. There are about 4½ whorls.

Major diam 21, min. 16, height 10½

Hab. Paurly, Garhwal, North-western Himalayas

A thick dart-sac was found, pointed at the retractor muscle Radula like that of Austenia gigas Rhachidian tooth strongly tricuspid; inner laterals bicuspid; outer laterals pointed, with an outer cusp some distance from the point; outermost teeth minute and unicuspid. [Formula. 40.2.22.1.22.2.40 (64 1.64).] [This and the sculpture make it very distinct from the two preceding species.]

237 Euaustenia paurhiensis, Godwin-Austen (Austenia), Mol. Ind 11, 1899, p. 109, pl. 91, figs. 2-2 o (shell and animal)

Shell ovately depressed, thin, translucent, finely and irregularly stricted, slightly polished, yellowish horny, spire convex, aper exserted, suture impressed; whorls 4, tumid, the last rounded at periphery and beneath; aperture oblique, subcircularly limate; peristome very thin, upper margin nearly straight, columellar sinuate, almost vertical on the whole.

Major diam. 13, min. 101, height 6 mm.

Hab Paurhi, Garhwal.

The specimens appear to be young, and may belong to E. cassida. The radula showed the following teeth. 36.2.15.1.15 2.36 (53 1.53).

238 Euaustenia theobaldi, Godwin-Austen (Austenia), Mol Ind 1, 1888, p 236, pl. 52, fig. 5.

Shell very similar to E. cassida, but distinctly more globose, aperture nearly circular, rather darker in colour.

Major diam. 19, min. 15, height 101 mm

Hab Chinab Valley, above the Bichlam River in Kashmir; Dharmsala in the Kangra Valley (Theobald).

This may possibly be a globose variety of E cassida

Subgenus SYAMA *

Type, Macrochlamys prona, G! Nevill.



[Fig 55—Syama annandales Part of the gentalia

οU	Cæcum Epiphallus Kalc-sac or fingellum, Oviduct, Prostate	รฑิก	Male organ Retractor muscle of male organ Spormatheca. Vas deferens]
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^{*} A Sanscrit word for "black"

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Animal mostly very dark coloured, with right and left shell-lobes. No amatorial organ in the genitalia; the male organ as in Macrochlamys.

239. Syama splendens, Hutton (Nanina), J A S B vii, 1, 1838, p 215, Pfr (Helix) Mon Hel 1, 1848, p 73; 1d 1b 1v, 1859, p 124, H & T. (Helix) C I 1876, pl 51, figs 7, 10 (is another species), Nevill, Nanina (Bensonia), Hand-l 1, 1878, p 49 (P Panjab), 1d Nanina (Bensonia) Yark Miss, Mol 1878, p 18, Godwin-Austen, Mol Ind 1, 1883, p 100, pl 21, fig 3 (sculpture), pl 22, figs 4, 4 \alpha (shell)

Shell narrowly perforate, subdiscoidly depressed, smooth, horny, brownish tawny above, paler, squetimes whitish, beneath; radiate (transverse striation almost obsolete), concentric longitudinal impressed lines microscopic, flexuous and irregular, spire scarcely raised, suture very slightly impressed, whorls 7-8, closely wound,



Fig 56 — Syama splendens

almost flat above, the last rounded at the periphery, flatly convex below, moderately excavated around the umbilicus; aperture slightly oblique, broadly lunate; peristome simple, straight, with a white callous labiation a short distance inside, columellar margin oblique throughout, scarcely reflected at the perforation.

Major diam. $15\frac{1}{2}$, min. $13\frac{1}{2}$, height $6\frac{1}{2}$ mm.

Hab. Western Himalayas, near Mussoorie and Simla, at elevations of 7000-10,600 ft. (Hutton). The type was from Mahasu, near Simla

Animal dark verdigris-green (Hutton), pale grey (G-A). Small right and left shell-lobes, the left dorsal lobe divided into two Radula like that of M indica 30.2.12 1 12.2 30 (44.1.44) (Godwin-Austen). [This description of the animal refers to a specimen sent to me as splendens by Mr Theobald from Murree, possibly one of those referred to in Jour Asiat. Soc. Bengal, 1878, p 141, from Uri, Jhelum Valley, Kashmir. The shell of this species is very similar to Hanley's figure in the Conch. Indica, pl 51, and very likely the same as the shell Nevill determined as splendens in 'Second Yarkand Mission,' p. 18]

More than one species may be found in collections with this name. The shell figured by Hanley (C I. pl. 51, figs 7, 10) as Helia splendens is not Hutton's original species described by Benson [Is quite a distinct shell, from Murree, described below (No 245) and referred to above] Hutton in this as in

at different times [This is much more likely to be a mistake made by Hanley. The first specimens I collected at Mussoome were named for me by Captain Hutton and are now in the Natural History Museum. Hutton only knew the typical Mussoome and Simla form, he had never seen the species from Murree]

240. Syama prona, Nevill, Nanina (Macrochlamys), I'arl. Miss, Mol. 1878, p. 17, Godwin-Austen, Mol. Ind. 1, 1883, p. 103 (desc. animal), pl. 22, fig. 2 (shell), 11, 1898, p. 48 (radula and jaw) Macrochlamys masuriensis, Godwin-Austen, Mol. Ind. 1, 1883, p. 94 (no description), pl. 21, fig. 8 (sculpture on shell).

Shell perforate, depressed, almost discordal, rather solid, light tawny or brown, rather dull, not polished, smooth, with moderately close, fine, regular, longitudinal strim, sometimes more or less papillate, spire almost flat, suture impressed; whorls 5–6, flatly convex above, the last whorl rather broader, rounded at the perphery, not swollen beneath; aperture nearly vertical, broadly lunate, with very frequently a thickened rib some distance inside the peristome, the latter is thin, basal margin slightly arcuate, columellar oblique, briefly and narrowly reflected.

Major diam. 16, min. 141, height 7 mm.

Hab North-western Himalayas

Reported from Garhwal, Nami Tal (typical var.), Mussoone, Simla, and Tandiani near Murree Nami Tal specimens are small, only 12 mm in diameter the shell of which the dimensions are given above was from Garhwal, a Mussoone shell measures 18×16×7 mm, and has distinctly papillate sculpture (M. masuriensis); smaller shells from Simla measure 14×12×6 mm and have the sculpture not papillate.

[Much confusion has been found to be the result of starting with the idea that this species, S. prona, had a range extending from Naini Tal on the east and even further, from the Dafia Hills in Assam (Nevill) westward to Murree. When specimens from the several localities on this range are examined together and placed side by side the variation is so considerable, it is necessary

to separate some of these and give them specific rank

I have left intact all that Dr. Blanford wrote His description of prona seems to be a general one; the precise locality of the shell described is not indicated, and now it is not possible to find the specimen.

The type of S prona was from Nami Tal. Nevill's original

description is as follows -

"Whorls six, closely wound, the last only slightly deflected, sometimes not at all, in which case, of course, the aperture is quite vertical, spire almost or quite flat, periphery rounded; umbilious resembling that of Nanina petiosa, more open than in all

SYAMA, 155

the other allied species, horny-brown colour, smooth and polished above and below, margins of aperture distinctly, but slightly thickened Type from Naim Tal: diam. 12, axis 4½, alt 5¾; apert lat 6, alt 4¾ mm"

I am inclined to think that Nevill did not confine himself when writing the above description to a single shell; he had numerous specimens before him from various places and was at the time working out Dr Stoliczka's collection made at Murree, finally

determining a shell from that place as prona.

I have recently obtained from Nami Tal (N Annandale) specimens of exactly the same diameter as Nevill's type. The axis is the same, viz 45 mm, but the difference between that and the height of the shell is as much as 125 mm, clearly showing that the specimen was on spire not "almost or quite flat," which applies exactly to the Simla form, of which I have

9 examples to refer to

Description of a shell of this species from Kichha, Nami Tal—Shell depressedly conoid, solid, shiny, rather closely umbilicated, sculpture quite smooth, with fine transverse lines of growth; colour rich ruddy brown, spile flatly conoid, apex blunt, suture well impressed, whorls 5½, well founded on periphery, gradually increasing, rather closely wound; aperture lunate, nearly vertical (indication of an earlier aperture is marked by a pale band); peristome somewhat thickened, basal margin scarcely situate; columellar margin suboblique, very slightly reflected.

Size (largest specimen) major diam. 12 25, min. 10 8; alt. axis

5.0, height 6 75 mm.

Animal with lobe over the mucous pore, very dark grey both on foot and dorsal lobes. Both right and left shell-lobes present, but short, visceral sac darker; renal organ ochre, ochraceous on sole of foot. Generative organs a coiled cæcum, to which is attached the retractor muscle; a very long kalc-sac; no amatorial organ.

Central teeth tricuspid, admedian teeth elongate, narrow, with cusp on outer side; the 12 first marginals bicuspid, the outer cusp low down, the next 18 aculeate, and the outer marginals very

small. Formula. 30 2.10 1.10 2.30.]

[241. Syama prona, var. huttoni, Godwin-Austen.

Shell well perforate, depressed, almost discoid, base flat, rather strong, sculpture quite smooth; colour light tawny or light brown; spire scarcely raised above the last whorl, apex rounded, suture impressed, whorls 5, regularly increasing, somewhat closely wound, rounded on the periphery; aperture flatly lunate, nearly vertical; peristome thin, basal margin slightly sinuate; columellar margin oblique, hardly reflected

Size: major diam. 13 75, minor 120; alt. axis 4.75, height

6.5 mm.

Hab. Simla (Captain T Hutton) British Museum Natural History This shell was sent home by Capt. Hutton a long time ago as II. petiosa, a name afterwards transferred to the species found on the hills south of the Ganges. He also considered this and the Mussoorie form the same]

[242 Syama promiscua, Godwin-Austen Macrochlamys prone, Nev, Theobald, J A S B 1, pt 2, 1881, p 46.

Shell hardly perforate, subdiscoid, not very solid; sculpture quite smooth, lines of growth not showing; colour very pale brown, a white band behind the aperture; spire very low, only just above the level of the last whorl, apex rounded, suture shallow; whorls 5½, regularly increasing, the last rounded on the periphery; aperture nearly vertical, broadly lunate, peristome thin, scarcely sinuate on basal margin; columellar margin very oblique, no reflexion.

Size. major diam. 120, mm 110; alt. axis 4.5 mm

Hab. Tundiani, near Murree

This shell may be distinguished from S. prona by its more discoid form, small perforation, and smooth surface. The animal is described by Theobald as "long and slender, and dark slaty above with long tentacles". His largest specimen of 6 whorls measured $15 \times 13.4 \times 7.8$ mm.]

[243 Syama masuriensis, Godwin-Austen, Mol Ind 1, 1883, p 94, pl 21, tig 8 (sculpture on shell)
Macrochlamys prona, id ib p 103, pl 22, figs 2, 2 a (shell).

Shell very closely umbilicated, discordal, base flat; sculpture linear-longitudinal, each line formed by close-set papillate dots, colour pale sienna-brown, a darker conspicuous band of same colour near the aperture, progress of growth is shown by the ochraceous bands behind it at intervals, spire very depressed, apex very flattened, suture adpressed; whorls 6, regularly increasing, sides flat above, rounded on the last, aperture lunate, subvertical, peristome thin, straight, scarcely reflected and very obliquely descending on the columellar margin

Size. major diani 182, alt. axis 7.0 mm.

Hab. Mussoorie, N.W. Himalaya.

Animal (of the Mussoome form) very black and long, a very sharp-pointed lobe over the mucous gland. Mantle slightly reflected over the margin of the peristome, with two right and left tongue-shaped expansions, which the animal expands and contracts Animal of specimen from Paurhi in Garhwal also black Teeth of radula 30.2.10.1.10.2.30 (or 42.1.42). Admedian teeth long, with a cusp on the outer side, the laterals bicuspid, inner point the longest, the ten or twelve outermost

very small. Jaw moderately arched, with small central projection]

[244. Syama annandales, Godwin-Austen (Fig 55, p 152)

Shell perforate, very depressedly conoid, thin, flat on base; sculpture quite smooth, lines of growth very fine; colour dull umber-brown; spire low, apex rather blunt; suture somewhat impressed; whorls 5½, evenly increasing; no indication of previous apertures as in S piona, aperture flatly lunate; peristome very thin; columellar margin very oblique, scarcely any reflection.

Size. major diam. 16, min. 14; alt. axis 65, height 85 mm

Locality. Bijnois (N. Annandale)

Animal On removing the shell the visceral sac is black, the

renal organ white, a great contrast with it.

Genitalia as in S. prona The retractor muscle is short and stout, attached to a well-coiled cocum; the kalc-sac is very long, flagellum-like The spermatheca elongate (fig 55)

Teeth of radula as in S. prona. Formula .+2.12.1.12.2.

Marginals lost

[245. Syama? theobaldi, n sp Maciochlamys splendens, Hutton, H & T (Helix) C I. 1876, pl 51, figs. 7, 10, Theobald, J A & B. xlvii, pt. 2, 1878, p 141, Nevill, Yaik Miss, Mol 1878, p. 18

Shell globosely conoid, narrowly umbilicated; shining surface also seen on the basal side; sculpture somewhat irregular, coarse, longitudinal striation; colour burnt-sienna; spire subconic, sides slightly convex, apex blunt, suture impressed; whorls 6, regularly increasing, aperture ovately lunate, subvertical; peristome simple, with a white callous labiation just within the aperture: columellar margin oblique.

Animal not seen

Size major diam. 13 25, min. 12, alt axis 5 5 mm

Hab Muiree, Panjab Himalaya (W. Theobald), Tinali (Stoliczka). Theobald says:—"Colour bright chestnut, with a lustrous polish My largest shell is not quite adult and measures 15×13×8 mm This species occurs rather plentifully in places above Uri (Jhelum Valley), nestling under stones." In all probability Mr Theobald sent this shell home to Mr. Hanley, and the latter figured it as Helix splendens in the 'Conch. Indica.' The shell agrees very well with the figure.]

Genus KHASIELLA.

Khasiella, Godwin-Austen, Mol. Ind 11, 1899, p. 129

Type, K vidua, Blf.

Range The Eastern Himalayas, the Assam and Arakan Hills, and Northern Burma Perhaps Tenasserim

Shell perforate or imperforate, depressed or considly turbinate,

keeled or subangulate at the periphery, generally rather thin and in typical forms plicate to costulate above, smooth beneath, generally closely wound

In the typical species, the only one of which the anatomy has been described, the right shell-lobe is present, but small, the left doisal lobe consists of two separate parts. The sole of the foot is distinctly divided into three. The mucous gland, which is wider and overhung by a lobe, does not extend to the sole of the foot

Generative organs The retractor muscle of the penis is peculiarly short and solid and is attached to the flexure of a short free bent exerum, which unites with the main organ at some distance from the origin of the latter, the vas deferens joins the penis close to the base of a long, blunt, knobbed kale-sac. Spermatheca long, with a bulbous end. Amatorial organ moderately developed.

Odontophore as in Macrochlamys The middle tooth of each row has a well-developed cusp on each side; the inner laterals are bicuspid, having a lateral cusp on the outer side only, the outer laterals (marginals) are bicuspid at first, then aculeate towards the

margin

Jaw with a median projection.

The name Khasiella was proposed for a small group of snais found in the ranges south of Assam and at the base of the Eastern Himalayas, and which had been referred for some time to Euplecta. The anatomy, however, is nearer to that of Macrochlamys than to that of Euplecta and Ariophania.

A Imperforate

246 Khasiella vidua, H & T (Bif MSS) (Helix) C I. 1876, pl. 130, figs 2, 3, Godiom-Austen, J A & B 1876, 2, p 212 Bif. (Euplecta) J A & B 1880, p 190, pl 2, fig 5, Godiom-Austen (Khasiella), Mol Ind 11, 1899, p 129, pl 100 (anatomy).

P Helix climacterica, var P nana, Bs A M N H (3) 111, 1859, p. 392

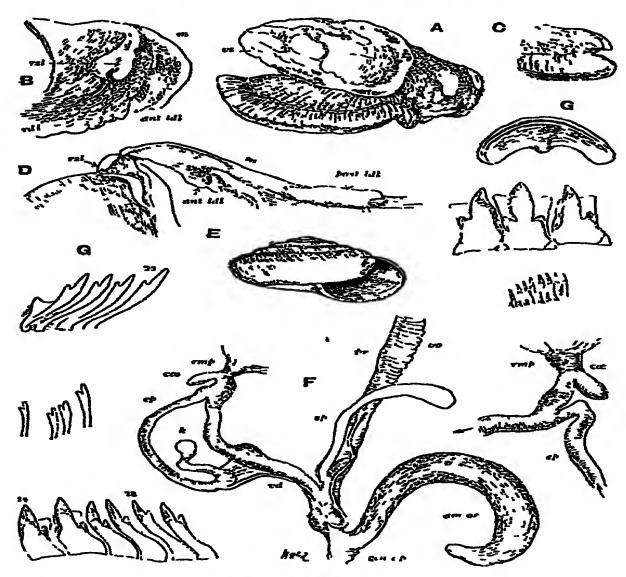
Shell imperforate, conoidly depressed to turbinate, fulvous horny, generally paler beneath, ornamented above with oblique, close, and arcuate filiform costulate striation, smooth beneath with radiating strise, spire depressedly conoidal to conical, apex rather sharp, suture impressed; whorls 8, narrow, convex, slowly increasing in size, the last angulate or subangulate at the periphery, scarcely descending, moderately convex below, aperture oblique, lunate; peristome white, more or less obtuse, with a very slight thickening inside, the basal margin arcuate, the columellar oblique, gently curved, slightly reflected throughout, more broadly above

Major diam. 17, min 15½, axis 9 mm

Hab The Dafia Hills to north, and Garo, Khasi, and Naga Hills south of Assam (Masters, Godwin-Austen), Chittagong

The conoidly depressed form passes into a turbinate variety, generally smaller A specimen of this turbinate variety from the Naga Hills measures 14, 12½, and 9 mm, in its three diameters

Nevill (Hand-l 1 p 30) classes this as a valuety of K. climacterica, but, despite some appearance of passage, the two forms are easily distinguished, K climacterica being distinctly keeled and depressed, K vidua angulate to rounded and generally subturbinate



[Fig 57 -Khasiella vidua

A Anunal, spirit-specimen, muntle-zone removed ×3

B Mantle-zone removed, showing the right and dorsal lobes × 6

C Extremity of foot × 325

D Mantie-rone, showing the right and dorsal lobes posterior dorsal le turned back × 6

E Shell × 225

F Generative organs $\times 38$ and 6

G Jaw × 18, teeth of radula, × 273]

247. Khasiella climacterica, Bs (Helia) J A S B v, 1836, p 352, id A M N H (2) 11, 1848, p 163. id (3) 111, 1859, p 392, Pf: Mon Hel 1, 1848, p. 219, id 111, 1853, p. 170, id vi, 1876, p 302, Bif J A S B 1805, p 93, Godion-Austen, J A S B 1876, 2, p 312, H & T C I 1876, pl 55, figs 4, 5 Helix gerton, Theobald, J A S. B axxiii, 1864, p 242

Shell imperforate, depressedly conoid, keeled, pale horny, radiately and closely subcostulate above, smooth beneath, the filiform ribbing extending below the keel; spire low, conical, apex rather acute; whorls 7–8, narrow, closely would, flat above, each rising slightly above the next at the suture, the last keeled, not descending, moderately swollen below; aperture scarcely oblique, narrow, angulately lunate, securiform, peristome obtuse, slightly thickened inside, basal margin arcuate, columellar curved, slightly expanded, more broadly above, where it finally becomes almost vertical

Major diam. 21, min 19, axis 9½ mm

Hab. Dafla Hills north, and Khási Hills south of Assam (Theobald, Godwin-Austen, &c); Arakan Yoma, Long Island,

Bassein River (W. T. B)

This species varies in size and in the height of the spire, but the portion below the keel is generally deeper than the spire is high. The Burmese variety is small, depressed, and sharply keeled; the smallest specimen from the Arakan Range measures only 13½, 12½, and 6½ mm. Theobald's *H geiton* is a dwarf Khási variety, 13–15 mm in major diameter.

248. Khasiella austeni, Bif (Nanna) J A S B 1870, p 15, pl 8, fig 10, Pfr. (Helix) Mon Hel vn, 1876, p 803, H & T. (Helix) C I 1876, pl 50, figs 8, 9.

This is distinguished from K. climacterica by smaller size, higher spire, much sharper keel, and stronger sculpture above. The general shape is almost lenticular, the keel is compressed and serrated, and in the inner whorls projects slightly above the suture.

Major diam 14½, min 13½, axis 6½ mm. Hab Habiang Gáro Hills (Godivin-Austen) All these three species pass into each other.

B. Perforate.

a Periphery rounded or subangulate.

249. Khasiella ornatissima, Bs (Helix) A M N H (3) iii, 1859, p 269; Pf. (Helix) Mon Hel v. 1868, p 113, H & T. (Helix) C. I 1876, pl 60, hg 4 Godwin-Austen, J A S B 1882, 2, p. 70, pl 5, hig 8 (animal)

Helix anopleurs, Theobald (Bs MS, and H submissa, Bs MS), J A S B xxxii, 1864, p 242 (no description), Bif J A S B.

1865, p 104, Nevell, Hand-l i, 1878, p 31

Shell openly perforate, conoidly depressed, pale horny above, regularly and arcuately costulate, smooth, polished, with obsolete radiating struction beneath, spire low but varying somewhat in elevation, apex slightly prominent, suture impressed, whorls 7, closely wound, convex above, the last subangulate at the periphery, somewhat tunid beneath, aperture oblique, lunate; peristome white, slightly thickened inside in adults, basal margin straight or arcuate, columellar slightly expanded

Major diam 161, min 15, axis 81 mm

Hab Pankabari, at base of Sikhim Himalayas (W T. B), Someysar Hills, north of Gorakpur (Theobald), probably foot of Himalayas in Nepal and Sikhim.

Very similar to the typical depressed form of K vidua, but distinguished by being perforate and by its much stronger and

more regular sculpture

250 Khasielia? pansa, Bs (Helix) A M N II (2) xviii, 1856, p 252, Ifi. (Helix) Mon Hel ix, 1859, p 28, id v. 1868, p 79, Blf J A S B 1865, 2, p 88, H & T C I 1876, pl 56, fig 1, Nevil, J A S B. 1877, 2, p 17, id Hand-l i, 1878, p 20 v Mart (Macrochlamys) Jour. Lann Soc xxi, 1889, p 162

Similar to K. ornatissima, but thinner, more narrowly perforate, and less excavated in the umbilical region, with a rather higher spire and finer closer costulate striation above; there are 7 whorls in adults, the peristome is thin, without any trace of internal labiation

Major diam 16½, min 15, axis 9 mm.

Hab The Irrawady Valley from above Ava to below Prome, Sullivan Island, Mergui Archipelago (Anderson)

251. Khasiella? falcata, Bif J A S B 1870, 2, p 15, pl. 3, fig 11.

Pfi (Helix) Mon Hel vii, 1876, p 92, H & T (Helix) C I
1876, pl 54, fig 10

Shell openly perforate, conoidly depressed, thin, horny, with fine, oblique, arcuate, subdistant, filiform costulation above, the riblets extending to below the periphery, smooth, polished, and radiately striated beneath, spire low, conoidal, suture impressed, whoils 6, convex, rather closely wound, the last broader, subangulate at the periphery, convex below, concave around the umbilicus; aperture slightly oblique, lunate; peristome thin, basal margin arcuate, columellar nearly vertical and produced forwards at the umbilicus

Major dram. 13, min 12, axis 6½ mm.

Hab Habiang Garo Hills * (Godwin-Austen); Upper Burma (Fea)

* [This indicates the southern side of the hills intervening between the western boundary of the Khasi Hills and the independent Garo tribes. When I was there in 1866, the people were hardly under our rule, but were safe to go among, not so the Garos on their west. I cannot say whether Habiang Garo is the Khasi name for these people or whether it is a Garo term.]

A smaller thinner shell than K. ornatissima, with fewer whorls and more distant less distinctly costulate sculpture.

252. Khasiella ² pingoungensis, Godwm-Austen (Euplecta), P Z & 1888, p 242

Shell perforate, conoidly depressed, sublenticular, pale yellowish horny, archately and filiformly costulate above, the costulation passing over the periphery and disappearing on the lower surface, which is smooth and polished in the middle, spire low, conoid, apex obtuse, rounded, suture impressed, whorls 6½, convex, rather closely wound, the last bluntly angulate at the periphery, convex beneath; aperture oblique, angularly lunate, margins slightly converging; peristome rather obtuse, upper and basal margins arcuate, right margin sinuate, columellar margin almost vertical at its insertion and briefly expanded.

Major diam 14, min. 13, axis 7 mm.

Ilab Pingoung, Shan Hills, Burma (Spi att).

b. Periphery sharply keeled.

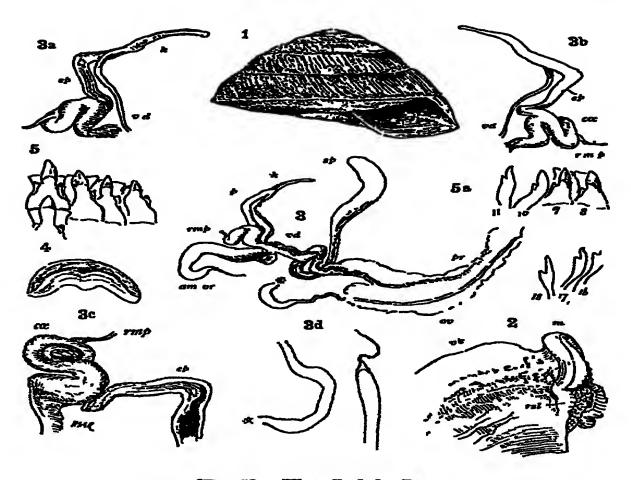
253 Khasiella serrula, Bs (IIelia) J A S B v, 1836, p 352, Pfr (1Ielia) Mon Hel 1, 1848, p 206, id. vii, 1876, p 291, H § T (IIelia) C I 1876, pl 50, fig 7
Helia bensoni, v d Busch, Phil Abbild i, 1842-5, p 11, pl 1, ing 7

Shell openly perforate (narrowly umbilicated), depressedly subturbutive, almost leuticular, whitish horny, costulately plicate, spire low, conneil, apex acute; whorls 6½-7, slightly convex above inside, each with a compressed keel, which projects above the suture, the last whorl moderately convex beneath with an acute keel, serrated by the transverse plications which pass over it to the lower surface and there pass into undulating radiate striation, aperture slightly oblique, angulately lunar, peristome thin, basal margin slightly arcuate, and together with the columniar margin faintly reflected

Major dum 13, mm. 12, axis 7 mm Hab Khisi Hills (base of).

254 Khasiella hyba, Bs (Helix) A M N H. (3) vii, 1861, p 83, Pf. (Helix) Mon Hel x, 1868, p 181, H & T (Helix) C I 1870, pl 30, hgs 2, 3, Theobald (Trochomorpha), J. A & B 1878, 2, p 148, Godwin-Austen, A M N. H (7) xx, 1907, p 55, figs 1-5a

Shell openly and perspectively umbilicated, convexly subtrochiform, thin, obliquely, closely, and coarsely plicate, crossed by fine, close, subcostulate spiral (longitudinal) strip above, smoother and irregularly reticulately striated on base, brownish horny, spire convexly conoid, sides convex, apex obtuse, suture linear, scarcely impressed, whorls 7–8, flatly convex above, slowly increasing, the



[Fig 58 —Khasiella hyba, Bs

1 Shell × 48

2 Side view of mantle-edge from right side, showing the obscure right shell-lobe, foot, &c × 8

3 Genitalia × 45

- 3a, 3b The penus, as seen from two opposite sides, to show the coiled excumnad position of the retractor muscle attachment, the kale-sac or flagellum, $3a \times 8$
- 3 c A portion of same organ more enlarged, slightly pressed between two glass slips and viewed by transmitted light, to show the close-coiled encum, the dark portion is part of a spermatophore × 12

3 d Terminal end and distal end of an organ not located in the genitalia and with which it may have no connection × 12

4 Jaw × 24

- 5 Central tooth and three admedian teeth of the radula × 368
- 5 a Eighth to eleventh admedian and sixteenth to eighteenth lateral teeth

cp Epiphallus

% Kale-sac or flagellum

d. Vas deferens

ca Crecum

p Penis

rmp Retractor muscle of penis

am or. Amatorial organ

pr Pi ostate

ral Right shell-lobe

f Foot

vs Visceral sac

ov Oviduct.]

last not descending, sharply carmate, compressedly at the base, flatly convex beneath, hollowed around the umbilicus, aperture diagonal, angulately lunate, peristome thin, columellar margin oblique, coming forward and slightly expanded around the umbilicus

Major dam. 13½, mm 13, height 7½ mm

Hah Dakhinkhund, Bari Doab, Western Himalayas (J D

Smithe), between Dalhouse and Chamba (Theobald)

A larger variety was obtained by Theobald on the hills behind Aijas, east of the Walar Lake, Kashmir this measures 171 × 164 × 10 mm. The shell, a both Benson and Theobald notice, resembles the Nilgiri Thysanota guerra, but, as the latter

also observed, the animal is a Zon id.

[Original description of the animal —" On removing the shell the usceral sac is pale-coloured, sparsely and finely spotted with black on the line of the rectum The toot is short and very narrow, indistinctly divided, dark grey, a distinct mucous gland overhung by a blunt lobe, peripodial giooves, and a well-marked fringed maigin to the foot There is a small but distinct and seirated right shell-lobe, which would spread turther in life; the left is a marginal band on the edge of the peristome. The generative organs were of great interest as they were unfolded. The amatorial organ is of the usual form, the penis refractor muscle given off from a distinctly coiled excum at the head of the main penis-There is a long epiphallus thence to the junction of the vas deterent, with a long kalc-sac adjacent, in which a spermatophore had been developing. The spermatheca is very long, gradually enlarging to the distal end, and contained three spermatophores, these are of the type I have described in various species of Macochlamys, Austenia, &c. The flume had no large spines, but very minute ones cou d be detected on the edges of it. The oxiduct is peculiar, very straight up to the albumen-gland, so was the line of the prostate

"The jaw is strong and solid, slightly arched into a central

projection

"The radula has the formula

"The teeth are of the usual form in so many genera of the Zonitide, the laterals being bicuspid, with the outer cusp below the

mmer, becoming very small on the margin '

Compared with the type of Khastella, there is (1) the same small obscure right shell-lobe, (2) the same form of foot and mucous gland, (3) the jaw and indulative precisely alike, (4) the generative organs differ in no appreciable way, merely that the short free encum retractors penis of K. widua becomes a close-wound coil in K hyba. The shells of these two species present at first sight considerable differences, but the variation becomes less apparent

when K. hyba is compared with the sharply-keeled species of this genus, such as chmacterica, Bs , austeni, W. T Blf , and serrula Bs]

Of doubtful affinity, plicate or ribbed above, carinate or angulate at periphery.

a Perforate

*255 Khasiella? chloroplax, Bs (Helix) A M N H (3) N, 1805, p 14, Pf: (Helix) Mon Hel v, 1868, p 80, H & T (Helix) C I 1876, pl 32, figs 1, 4, Nevill, Nanna (Rotula), Yark Miss, Mol 1878, p 16, id Hand-l 1, 1878, p 33

"Shell perforate, subconordly depressed, thin, plicately striated above, slightly striated beneath, very finely decussated, translucent, scarcely polished, greenish horny; spire subconoid, depressed, apex obtuse, suture impressed; whoils 5, slowly increasing, rather convex, the last angulate above at the periphery, convex beneath; aperture oblique, angularly lunate, peristome thin, straight, margins widely separate, columellar margin scarcely reflected

"Diam. barely 8, axis 4 mm." (Bs, Latin.)

Hab Near Simla (Theobald), near Murree (Stoliczka, teste

I have not been able to see a specimen of the Simla form, and the shells I have examined from Murree, apparently determined by Nevill, do not appear to me to agree with Benson's description or Hanley's figure, they are much higher in the spire and brow., not greenish horny, and I cannot detect decussated sculpture It is uncertain whether the type was adult. Some shells from Murree, according to Nevill, measured 11 mm in diameter and 6 in height.

In Hanley's figure a compressed keel is shown, the aperture is elliptically ovate, and the columellar margin of the peristome is

much curved and vertical above.

This and the two next species are referred to Bensonia on account of the resemblance of their shells to the larger forms B. camura and B nipalenses.

256 Khasiella? kashmırensis, Nevill, Nanna (Rotula), Yaik Miss, Mol 1878, p 16, pl figs 13-15, 1d Hand-l 1, 1878, p 33

Shell perforate, conoidly depressed, almost lenticular, carinate, thin, plicately striated above, less strongly beneath, the striation becoming obsolete towards the umbilicus, not polished, translucent, brown, spire low, conoidal, suture slightly impressed; whorls 5, rather convex, slowly increasing, the last sharply keeled, convex beneath, not excavated around the umbilicus; aperture oblique, angularly lunate (the angle disappearing in adults), peristome thin, columellar margin slightly oblique above, curved below

Major diam $7\frac{1}{2}$, min $6\frac{1}{2}$, height $3\frac{3}{4}$ mm

Hab Sonamarg, Kashmir, abundant (Stoliczka)

This shell, of which I have only seen immature specimens, is described by Nevill as being smaller than chloroplax, with more closely wound whorls, higher spine, less acute keel, and more convex base The form of chloroplax with which the comparison was made was probably that from Murree, and, as already pointed out, it is uncertain whether that form is identical with the Simla type.

*257. Khasiella? sonamurgensis, Nevill, Nanina (Microcystis), Yark Miss, Mol. 1878, p 16, pl figs. 16-18, id Hand-l 1, 1878, p. 33

"Shell small, depressed, thin, horny brown, with the suture distinct, roughly, regularly, and closely ribbed above, sculpture of a similar kind, but almost obsolete, can be traced on the base, whorls 7, closely wound, the last scarcely, if at all, broader than the previous one, more or less subangulate at the periphery, base convex, distinctly excavated round a deep narrow umbilicus (9 perforation); aperture very shallow, the outer margin distinctly thickened, slightly subangulate in the middle; columella very slightly reflected, oblique, evenly rounded, without any angulation at the base, in this character resembling N. splendens and differing from N. prona I know of no Indian species like this interesting little shell, in shape it somewhat resembles the smooth N. woodrana

"Diam 11½, alt. 5½, axis 4½, apert lat 5½ mm" (Nevill)

Hab. Sonamarg, Kashmir (Stoliczka).

Dr. Stoliczka noted the presence of a mucous pore

b. Umbilicated

*258 Khasiella? tandianensis, Theobald (Trochomorpha), J A S B 1881, p 46

"Shell trochiform, keeled, narrowly umbilicated, thin, horny. Whorls 6, slowly increasing, coarsely striated transversely ture but slightly oblique, quadrately lunate Margin (of peristome) simple, near the columellar briefly reflected.

"Major diam 96, height 67 mm." (Theobald, in Latin) Hab. Near Tandiani, Hazara, in woods, at an elevation of

8500 feet

"The animal has a distinct overlanging lobe to the mucus-The nearest ally of the shell is perhaps T. hyba, Bs, which is found from Chamba to Kashmir."

Genus OXYTES

Oxytes, Pfr. Zentsch: Mal 1856, p 188, Godwin-Austen, Mol. Ind 1, 1883, p 123

Type, O oxytes, Bs. Range Eastern Himalayas, Assam Ranges, Shan States of Upper Burms, and Laos country, Siam

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Shell generally of large size, umbilicate or perforate, depressed,

in general sharply keeled, smooth, striated

As a rule there is no overhanging lobe to the mucous pore, though one is present in O. blanfordi and O. pollux. Mantle: right dorsal lobe triangular, well developed, left dorsal in two parts, the anterior large, the posterior very small, left shell-lobe without any tongue-like process, being merely a narrow ribbon reflected over the peristome; right shell-lobe wanting. Generative organs hermaphrodite ducts very long, spermatheca elongate, male organ with a short spindle-shaped kalc-sac and having the retractor muscle attached to a large coiled cacum; amatorial organ long, well developed

[Although the shell-lobes are a typical character of many genera of Macrochlamyine, the coiled cæcum is perhaps a more important one, and more likely to be persistent. The origin of shell-lobes in so many distinct genera seems due to the influence of very damp atmospheric conditions in a more or less forest-clad

country.]

Middle teeth of radula long, straight, without side cusps or with very small representatives of them, laterals also unicuspid or nearly so The formula in O. cycloplar is 26.11.1.11.26, in O or obia 27 15.1.15 27

I Sharply keeled, lenticular

A. Openly umbilicated.

259. Oxytes oxytes, B₁. (Helix) J A S B v, 1836, p 351, id A M N H (2) v, 1850, p 215, Pf; (Helix) Mon Hel 1, 1848, p 395, id (Helix) III, 1853, p 250, id (Helix) vii, 1876, p 453, H S T (Helix) C. I 1876, pl 26, fig 1, Nev Hand-I i, 1878, p 47, Godwin-Austen, J A S B 1880, 2, p 158, pl 11, fig 2 (animal), id Mol Ind 1, 1883, p. 124, pl 30, figs 1-3 Nanina (Oxytes) fidelis, Fulton, A M. N H (6) xviii, 1896, p 100

Shell umbilicated, depressed, obliquely striated, brownish horny, sometimes with a narrow rufous band below the keel, spire very low, apex rather pointed, whorls 5½, flattened above, the last sharply keeled, slightly swollen beneath, aperture oblique, angularly lunate, whitish inside; peristome thin as a rule, tinckened in old shells, basal margin slightly arcuate and with the columellar margin reflected, umbilicus deep, exposing all the whorls

Major diam 45, min 37, height 17 mm

Hab The ranges south of Assam, also the Dafia Hills to the north.

Some specimens are larger; Col Godwin-Austen has one measuring 56½ mm in major diameter. O. fidelis is a dwarf variety from the Khasi Hills, measuring 31½, 27, 12½ mm. It has 5 whorls and a peculiar, almost granular sculpture above and below, caused by the decussation of the struction by impressed fine spiral lines.

260. Oxytes shanensis, Godwin-Austen, Mol Ind 1, 1883, p. 128
Helix blanfordi, Th J A S B. 1805, p. 275, nec 1859, p 308,
id Cat p 22

This may be a variety of O ovijtes, from which it is distinguished by being more compressed and lenticular, and therefore more sharply keeled, the umbilicus is slightly smaller and the sculpture finer. Only immature specimens are known, one of these measures major diam 28, min 231, height 10 mm

Hab. Shan States, on Upper Salvin River (Fedden)

261 Oxytes cycloplax, Bs (Helix) A M. N H (2) x, 1852, p 312, Pfr Mon Hel 1v, 1859, p 181, H & T C I. 1876, pl 26, fig 7, Nev. Hand-l 1, 1878, p 48, Godwin-Austen, Mol Ind 1, 1883, p. 125, pl 31, figs. 1-8

This is very nearly allied to O oxytes, but it is smaller, less sharply keeled, with the keel becoming bluut and obsolete near the mouth; the spire is lower, the apex less pointed, the lower surface more tumid, and the umbilicis wider. As a rule, the sculpture consists of fine, rather flexuous, oblique stries, decussated by impressed spiral lines, but there is some variation in both the present species and in O oxytes. Colour brownish yellow, with a narrow rufous band round the last whorl just below the keel.

Major diam 38, min 321, height 15 mm

Hab. Sikhim, 1000-5000.

B. Narrowly umbilitated, umbilious about 2 mm. across.

262 Oxytes blanfordi, Theobald (Helix), J A S B NVIII. 1859, p 308, Pf: Mon Hel v, 1868, p 249, H S T C I 1876, pl 60, ings 1, 2, 3, Godwin-Austen, J A. S B 1882, 2, p 69, pl 5, fig 1 (animal), id. Mol Ind 1, 1883, p 128

Shell lenticular, sharply keeled, thin, dull chestnut, finely striated, with a minute reticulated sculpture under the inicioscope, spire low, conical, whorls 5½, flattened, the last much compressed near the keel, slightly convex beneath, aperture oblique, angulately lunate; peristome very thin

Major diam 27, min 24, height 10 mm.

Hab Kursiong, Sikhim, about 3000' above the sea

The animal is shown in Stoliczka's drawing, figured by Godwin-Austen, l c, to have a small but distinct lobe above the mucous pore

C. Perforate.

263 Oxytes castor, Theob (Helm) J A S B wwn, 1858, p 319, xwn, 1859, p 308, H & T C I 1870, pl 20, figs 3, 6. Godwn-Austen, Mol Ind 1, 1883, p 126

Namma cherraensis, Blf. J A S B 1870, p 14, pl 3, fig 8, Pfr. Mon Hel vii, 1876, p 131.

Shell lenticular, sharply keeled, thin, smooth, finely strated,

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decussated by minute, spiral, impressed lines above and below, light ferruginous brown, spire low, conical, apex acute, whorls 51-6, regularly increasing, flattened above, the last compressed at the keel, slightly convex beneath; aperture oblique, angularly lunate: peristome thin, the basal margin slightly arcuate.

Major diam 35, min. 33, height 15 mm.

Hab. Khasi Hills, Cherra Punji, Nongklao, Nongkulong, and Eastein Garo Hills

264. Oxytes pollux, Theob (Helix) xxvii, 1858, p 319, Blf J A S B xxxii, 1870, p 13, Ifi Mon Hel vii, 1876, p 132, H & T C I 1876, pl 26, figs 2, 5, Godwin-Austen, J A S B 1880, p 158, pl 11, fig 4 (animal), id Mol Ind 1, 1883, p 127.

Similar to O castor except in colour, which is pale horny with a lower spire and less marked spiral sculpture.

Major diam 35½, min. 32, height 13 mm

Hub Khasi Hills; Teila Ghat, Nongkulong; Habiang Garo

Hills (Theobald and Godwin-Austen)

The animal is pale yellowish other. Eye-tentacles thick and close together at the base and long. A small lobe above the mucous pore. Radula similar to those of O cycloplan and O. orobia, outer lateral teeth rather longer and more numerous.

As Godwin-Austen has pointed out, this is probably only a

colour-variety of O. castor.

265 Oxytes sylvicola, Bif J A. S B. 1880, p 185, Godwn-Austen, Mol Ind 1, 1883, p 130

Shell depressed, carinate, not very thin, covered with a thick yellowish-brown epidermis, decussated with oblique striation and spiral impressed lines, spire low, conoid; whorls 5½, nearly flat, the last moderately swollen beneath, but slightly compressed near the keel, aperture oblique, angularly lunate; peristome acute, slightly thickened inside

Major diam 32, min 29, height 17 mm

Hab Burail Range, North Cachar, and Anghami Naga Hills.

II Periphery sounded, not carinate.

266 Oxytes orobia, Bs (Helia) A M N H (2) 11, 1848, p 158.

Pf: Mon Hel 111, 1853, p 117, vii, 1876, p 220, H & T C I
1876, pl 28, fig 8, Nev Hand-l i, 1878, p 48, Godwn-Austen,
J. A S B 1880, p 157, pl 11, figs 1, 1 a, id Mol Ind 1, 1883,
p 129, pl 30, fig 4, pl. 82, figs 1-5 (anatomy)

Shell perforate, depressedly globose, smooth, striated, decussated by fine, close, concentric, impressed lines, white, covered with a thick, yellowish, horny epidermis, encircled by a narrow dark rufous band below the periphery, spire depressed, convex, whorls 5-5½, slightly convex, the last rounded, sometimes subangulate at the periphery, swollen beneath; aperture ovally lunate;

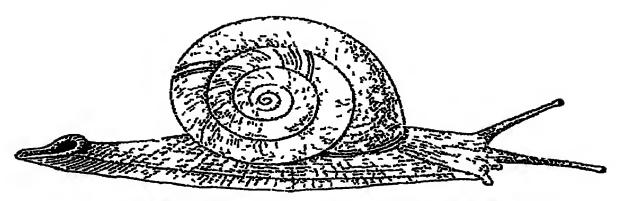


Fig 59 - Oxytes or obra (From Stoliczka's drawing)

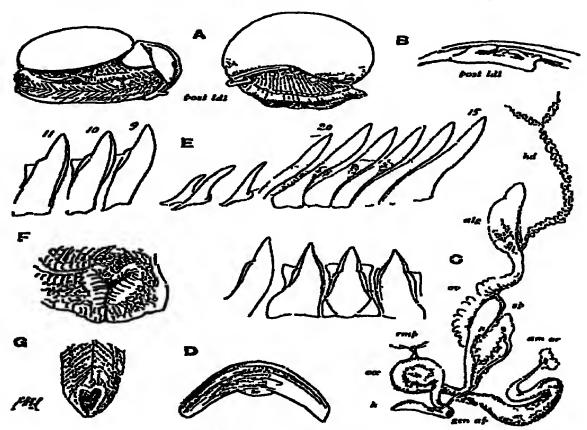


Fig 60 - Oxyles orobia

- A. Animal, spirit-specimen, shell removed, the right and left sides showing dorsal lobes

 B The posterior left dorsal lobe, enlarged
 O Genitalia

- Jan
- Teeth of the radula × 150
- OREF Extremity of the foot, contracted in spirit, enlarged

Oxyles oxyles

G Extremity of foot, drawn from life]

peristome oblique, acute, but thickened inside, basal and columellar margins somewhat reflected.

Major diam. 37, min. 30, height 22 mm. A more depressed shell measures 34, 29, and 19 mm.

Hab. Darjeeling, Sikhim, 7000-8000' in forest

This species has the shell of Bensonia; not only is the lip thickened inside, but former lips, produced during periods of rest, often occur as in B. monticola In the animal the eye-tentacles are separated by a wide interval at the base. There is no lobe above the mucous gland, which is large

Genus BENSONIA.

Bensoma, Pfr Mul Bl 1855, p 119, Godwn-Austen, Mol Ind 1, 1888, p 246, pl. 61 (anatomy), ad n, 1901, p. 115, pl 95 (anımal and anatomy)

Type, B. monticola, Hutt

Range. Himalayas from Sikhim to Afghanistan. Some Chinese species are also referred to this genus, but their animals need examination

Shell of typical forms perforate, depressed, subdiscoidal, of moderate or large size, thin; aperture lunate, peristome thin, but with a thickened callosity inside. In most of the species several lips remain, like varices, at irregular intervals on the whorls

The animal of Bensonia monticola generally resembles externally that of Oxytes and Arrophanta, except that there is a broad overbanging lobe above the mucous poie Mantle. right dorsal lobe simple, left divided into two; no right shell-lobe, left shell-lobe simple, without tongue-shaped process Generative organs similar to those of Oxyles, with the coiled cocum near retractor muscle; the dart-sac is large and long, and there is a small pointed kalc-sac. spermatophore is a long, narrow, chitinous libbon ending in a membranaceous sac with a hard termination. The edge of the ribbon bears bifid spikes.

The teeth of the radula in B. monticola differ from those of Oxytes and approach those of Mac ochlamys in form The median tooth of each row is strongly tricuspid, the inner laterals, also tricuspid, have an inner cusp near the point and an outer cusp near the base, the inner cusp is soon lost, the outer cusp disappears in about the 36th tooth, and the outer laterals become small and unicuspid, the outermost being very minute; the formula is.

72.19 1.19 72.

According to Hutton, the eggs of B monticola are about the size of a mustard-seed, oval and greenish white.

I. Rounded or subaugulate at periphery.

267. Bensonia monticola, Hutton (Nanna), J. A S B vn, 1, 1838, p 213, H & T C I 1876, pl 52, fig 3, Theob. J A S B. 1878, p 142, ed eb 1881, p 46, Godwen-Austen, Mol Ind 1, 1888, Helia labiata, Pf. P. Z. S. 1845, p. 65, al. Mon. Hel. 1, 1848, p. 73. vii, 1876, p. 21°), H. S. T. C. I. 1878, pl. 27, fig. 5, Godwin-Austin, t. c. 1888, p. 247, pl. 61, fig. 5 (anatomy)

Namina (Bensonia) montacola, var. murriensis, Nev. Yaik. Miss., Mol. 1878, p. 17.

Shell openly perforate, depressed, moderately thin, striated, the epidermis on the inner whorls more or less distinctly minutely decussated, with oblique raised lines, tawny yellow to brown, sometimes with a broad rufous spiral band above the periphery, the lip chestnut with a broad yellowish border behind, some other chestnut and yellow stripes, indicating seasonal arrest of growth,

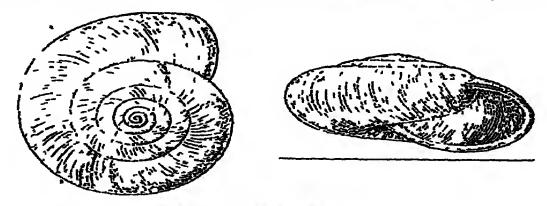


Fig 61.—Bensonia monticola

crossing the whorls at irregular intervals, spire low, considal; whorls 6-7, convex, the last rounded at the periphery, aperture oblique, broadly and subovately lunate; peristome acute, thickened inside with a white callosity, columellar margin reflected at the umbilicus

Major diam 40, min 33, height 18 mm

Hab Western Himalayas from Kumaon to Hazara at elevations of about 3000-7000 feet, and locally higher, not north of the

Pir Panjal in Kashmir

The deep rufous spiral band occurs in shells otherwise palecoloured, and is common apparently in Kumaon and Mussoorie specimens. The fine decussating markings on the inner whorls are variable, and appear to be obsolete on some Murree and Hazara shells.

268. Bensonia angelica, Pfi (Helix) P Z S 1856, p 33, id (Helix) Mon Hel iv, 1859, p 123, H & T (Helix) C I 1876, pl 86, figs 5, 6, Nev Nanna (Bensonia), Yark Miss, Mol 1878, p 18, Godwin-Austen, Mol Ind 1, 1888, p 252

Very near B. monticola, but darker in colour, without any distinct decussated sculpture, and with numerous varices, often 3 or 4 in the last whorl The colour is olivaceous as a rule, sometimes brown The types were small (major diam 31, min. 27,

height $13\frac{1}{2}$ mm.), but I have a shell, probably from Kashmir, measuring 45 mm across. On the other hand, a small variety from Chamba, barely adult, measures $23\frac{1}{2} \times 20 \times 11\frac{1}{2}$ mm

Hab Range south of Kashmir, Uri (Stoliczka); Chamba State,

8000'

269 Bensonia jamuensis, Theob (Hemiplecta) J. A.S. B 1878, p 142, Godicin-Austen, Oxytes (Bensonia), Mol Ind 1, 1888, p 251

This is a smaller shell than B monticola, finely and flexuously stricted, decressated with very fine and close spiral lines. It is depressed, thin, horny, becoming whitish beneath; whorls 6, the last rounded at the periphery, flatly convex beneath, the peristome thickened within, and the columellar margin rather broadly reflected at the umbilicus

Major diam 26, min. 23, height 12 mm

Hab. Tawi Valley, between Chaneni and Udampur, Kashmir This is, perhaps as Theobald has suggested, a small variety of B monticola, with few or no varices. Under the microscope traces of oblique decussating raised lines on the epidermis can be made out.

270 Bensonia theobaldiana Godiom-Austen (Nevill, MS), Mol Ind.
1, 1888, p 251 (no description), Kobelt, Nanina (Xestina), Mart
& Chemn Syst Couch - Cab, Naninidæ, 1900, p 980, pl 254,
ings 6, 7
Bensonia mimela, Blf Proc Mal Soc 11, 1901, p 179, ing

Shell subobtectly perforate, conoidly depressed, yellowish brown dull above, polished below, rugately striated, finely decussated with close impressed spiral lines throughout; spire low, conoidal; whorks 7, flat, scarcely convex above, the last bluntly angulate at the periphery, convex beneath; aperture slightly oblique, subangulately lunate; peristome thin, with the usual internal cillosity, which shows through the shell; former lips at irregular intervals, as in B monticola

Major diam 27½, min 23½, height 15 mm Hab Narkanda, E.N E of Simla; Kulu

Distinguished from B monticola by smaller size, flatter whorls, angulate periphery, different sculpture, and less oblique mouth A depressed form of B theobaldiana occurs on the Chor, S E of Simla A specimen in Col Beddome's possession, with 6½ whorls measures major dum 19, axis 8½ mm

The locality Kudin quoted by Kobelt for his Nanina theobaldiana is a mistake for Kulu. This and the two preceding species may

be varieties of B monticola

A single specimen of a shell, apparently belonging to Bensonia, was obtained by Col Beddome in the South Canara Ghats. It is doubtful if the single example obtained is adult, and without a knowledge of the animal it would be unsafe to decide as to its

generic relations, as no Bensonia is known from Peninsular India.

The following is a short description —

Shell perforate, depressed, dark fulvous, with a narrow chestnut stripe below the periphery, striated, finely and closely decussated; protoconch with undulating transverse striation, spire convex, whorls 4, convex above, the last angulate above the periphery, convexly swollen below; aperture oblique, roundly lunate; peristome thin, chestnut, with a white thickened lip inside.

Major diam. 19½, min 16½, height 10½ mm

This resembles B theobaldiana, but has fewer whorls and is more angulate.

271. Bensonia convexa, Rv (Helix) Conch Ic 1852, pl 127, fig 762, H & T C I 1876, pl 85, figs 1-4, Godwin-Austen, Mol Ind 1, 1888, p 252

PHelix monticola, Pfr Mon Hel. 1, 1848, p. 130, id. vii, 1876, p 220: nec Hutton

Shell subobtectly perforate, depressed, horny, thin, striated, minutely decussated above and below by fine, impressed, spiral, close lines; spire depressedly conoid, whorls 6-6½, flatly convex, the last slightly compressed externally, aperture oblique, broadly lunate; peristome thin, with a broad white callous thickening inside, no remains of varices except close to the mouth

Major diam 16½, min 14½, height 9 mm

Hab Kumaun, Naguba Range, north of Mussoorie, 9000'

(Godwin-Austen); Simla

Animal light brownish green, brown near head; tentacles greenish grey; foot rather short (Godwin-Austen)

272. Bensonia jacquemonti, & Mart (Nanna) Mal Bl X1, 1869, p 75, Pfr Nov Conch 1v, p 48, no 720, pl 118, ad Mon Helvu, 1876, p 220, Nev Yark Miss, Mol 1878, p 18, ad Handli, 1878, p 49, (var kurramensis) Godwin-Austen, Mol Ind 11, 1899, p 115, pl 95, figs 1-1: (animal and anatomy), Kobelt, Nanna (Xestina), Mart & Chemn Syst Conch-Cab, Naninde, 1901, p 997, pl 258, figs 7, 9

Shell perforate, depressed, smooth, finely strated, white and porcellance or horny, sometimes encircled by a rufous band above the periphery and inside the suture; spire very low but considal, whorls 5½, slightly convex, increasing slowly, the last rounded at the periphery, moderately convex beneath; aperture slightly oblique, broadly lunate; peristome thin, thickened inside, basal margin slightly arcuate, columellar reflected a little at the perforation.

Major duam. 17, min 15, height 10 mm.

Hab Murree (Stoliczka), Salt Range, Punjab (Theobald)
This is probably the species figured in the atlas to Jacquemont's
'Voyage,' pl 16, fig. 2.

273 Bensonia wynnii, Blf (Macrochlamys) J. A. S. B. 1880, 2, p. 197, pl 3, fig 5, Godwn-Austen, Mol Ind 11, 1899, p. 118, pl 95, iigs 2-2b, 3, 3a, Kobelt, Nanma (Xestina), Mart & Chemn Syst Conch-Cab, Nanmae, 1901, p. 996, pl 258, figs 4, 6.

Very similar to *B jacquemonti*, but distinguished by having the month much more oblique, diagonal in fact, and consequently larger, with the basal margin of the peristome straight, not arcuate, and with no trace of internal thickening.

Major diam 19, min. 17½, height 9½ mm

The aperture measures 10½ by 9 mm, in a specimen of

B. jacquemonts of about the same size 10 by 7

Hab Murree (Wynne), Cherat, near Peshawar, Kuram Valley, Kandahai

II Shell keeled at periphery

274. Bensonia camura, Bs A M N H (3) in, 1859, p 269 (Helix), Pf, Mon Hel v, 1869, p 180 H & T C I 1876, pl 55, fig 2, Newll, Hand-l 1, 1878, p 30 (Namina), p Godion-Austen, J A S B 1882, 2, p 71, pl 5, fig. 5, animal (Euplectap), id Mol Ind ii, 1907, p 147, pl 101, figs 1-7 (animal & anatomy)

Shell narrowly umbilicated, conoidly depressed, sublenticular, carmate, translucent, horny, obliquely rugosely plicate, and beneath the microscope minutely obliquely rugate, the rugæ intersecting the coarse striæ at an acute angle, lower surface smoother, but still minutely obliquely decussated with raised lines; spire depressedly conoid, sides flattened, suture very little impressed, whorls 6½, scarcely convex above, the last with a compressed keel, rounded beneath, aperture oblique, angulately lunate; peristome thin, with a slight white thickened callus inside not always present, the basal margin arcuate.

Major diam. 20, min. 181, height 10 mm.

Hab. Sikhim, 7000-12,000 feet.

Some specimens are larger. The compressed keel in the young is file-like. The shell resembles that of *Macrochlamys tugurium*. but is far more sharply keeled and different in sculpture. The animal is grey; sole broadly margined, and has, if the published figure be correct, a very small lobe above the mucous pore. this

lobe I failed to detect.

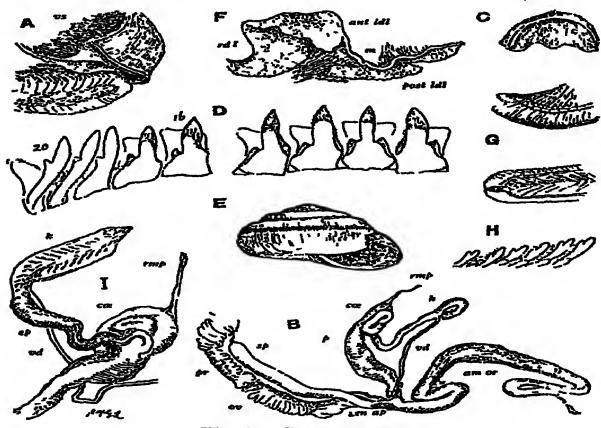
[Mr. W. Robert's collection, from Rissom Peak, Cheungtang, at the junction of the Lachen and Lachung Rivers, and Zemo Samdong, in mid-Sikhim, has cleared up much that was doubtful regarding both the generic position and range of this species. The animal (in spirit) is ochiaceous; on removing the shell there is a remarkable resemblance in the markings of the integument or root of the pulmonary cavity and renal organ to that of Macrochlamys tugurum, a broad patch near to rectum, and a longitudinal streak in the middle line, gradually widening and increasing in intensity backwards up to the ienal organ, above this it is half black, half white; the iest of the surface is spotted and streaked with greenish black. This greenish tint pervades the whole of the

whorls of the visceral sac and gives to the shell a similar tone of coloration. There are no shell-lobes, and by this character alone, without looking at any other, the genus and species may be recognized. The dorsal lobes are very much reduced in size, having regard to the size of the animal. The foot is not divided on the sole.

The lobe over the mucous gland is very small, the peripodial

fringe is very small, below the usual parallel grooves.

The generative organs. The penis has a coiled excum, to the side of which the retractor muscle is attached, the kalc-sac is



[Fig 62 -Bensonia camura

- A Part of the animal, showing right dorsal lobe $\times 2$
- B Genitalia ×24
- C Jaw X 9
- D Teeth of the radula × 276

Bensoma wynnu.

E Shell Nat size

Bensoma jacquemonts, var. kur ramensis

- F Dorsal lobes ×3
- G Extremity of foot, side view, contracted in spirit. × 3
 viewed from above from life Enlarged
- II Outermost lateral teeth of radula × 276
- I Genitalia × 6

short, the amatorial organ long and much twisted, and the two organs, as packed within the animal, lie respectively on the right and left sides The spermatheca is very long. The genitalia are not at their full development. they would at the paning-season be much more swollen

There is a central projection to the jaw

The radula shows the formula

About twelve of the outermost teeth are very minute, bicuspid teeth follow, the inner cusp being much the longest tooth is tricuspid, the admedians bicuspid, the outer small cusp

situated rather lower than usual from the main point

The absence of the shell-lobes and the long spermatheca place I would point out the this species in the genus Bensonia. very interesting resemblance it has to Macrochlamys turgurium, inbabiting the same area—externally noticeable in the coloured border to the peristome and the markings of the body seen through the shell; internally in the generative organs, showing how closely Bensonia approaches Macrochlamys.]

275 Bensonia nepalensis, Blf (Nevill, MS) P Z. S. 1904, u, p 441, pl. 25, fig. 1, Newll, Hand-l i, 1878, no 87, p 27

Shell openly perforate, conoidly depressed, sublenticular, thin, obliquely and rugosely plicate above, smoother and striated below, without any decussating lines; spire depressedly conoid, suture slightly impressed; whorls 6, convex, regularly increasing, the last not descending, keeled at the periphery, the keel becoming blunter near the aperture, turnid below; aperture oblique, roundly lunate, the margins converging; peristome thin, columellar margin regularly curved, vertical above, reflected throughout, broadly at the perforation.

Hab Khatmandu, Nepal. Types in the British Museum Major diam 231, min 21, height 12 mm.

This shell is near B. camura, but is distinguished by a lower (Godwin-Austen) spire, smaller umbilicus, stronger sculpture, and the absence of decussating striction, and by less scute carmation The animal is not known

[Subgenus DALINGIA.

Dalingia, Godioin-Austen, Mol Ind 11, 1907, p 149

Range. Hitherto found only on the Sikhim-Bhutan frontier. Type, D bhutanensis, Godwin-Austen Shell depressedly conoid, tumid, thin and delicate; whorls few. Animal has no shell-lobes; there are three peripodial grooves (a very unusual character). The retractor muscle of the male organ given off from a large oval mass. No amatorial organ.]

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[276 Dalingia bhutanensis, Godwin-Austen, Mol Ind. 11, 1907, p 149, pl. 102, figs 1-6 (shell and anatomy).

Shell depressedly conoid, very narrowly umbilicated, allowing the passage of a fine bristle, thus the umbilicus is almost hidden. Sculpture, to the eye, transverse wavy, lines of growth; under lens, longitudinal turrows are seen crossed by narrower ones, breaking the surface into irregular decussation. Colour rich olivaceous brown. Spire low, apex flatly conoid; suture impressed. Whorls 4, tumid, convex; aperture widely lunate, peristome thin.

Size: major diam 205 mm., alt axis 95 mm, alt. body-whorl

10 5 mm.

Locality. Richila Peak, on the Sikhim-Bhutan frontier

Animal can retire completely within the shell, and the specimens had been taken during hibernation, for the aperture was covered with a strong epiphragm, tough and transparent. It is dark-coloured Sole of foot with a distinct central area There are no shell-lobes; the left dorsal lobe is divided

The peripodial margin is broad, bordered above with a double row of oblony tubercles, or, in other words, there are three parallel grooves

instead of the usual two.

Genciative organs The amatorial organ is absent The retractor muscle of the male organ is given off from the head of a large orate swollen mass, which corresponds to the coiled mass seen in Oxytes orobia. There is a short flagellum or kale-sac. The spermatheca is moderately long and consists of an ovate membranous portion situated on a lower thick muscular tube; the albumengland was small, the hermaphrodite-duct extremely convoluted

Jaw with a large central projection

The radula has this formula —

The central tooth is tricuspid, the admedians also tricuspid, the inner well developed and standing higher than the outer, which is the largest. The marginals are curved, bicuspid, the outer cusp below the inner.

Of this species there were only two specimens in the B M collection with similar sculpture on the shell—one, an adult, from which the above description has been made, and another much younger example left in the shell; the pallial margin and markings on the visceral sac are the same in both

The anatomy of this animal is very unlike that of those with

sımılar shells.

It is remarkably like another in its shell-character inhabiting the vicinity of the same peak, Richila. On first sorting-out of a quart-bottle of shells from this locality I placed them together; on a second sorting I noticed considerable difference in the sculpture when this was looked at under a high power, combined with a modification in the form of the shell, of that

indefinable nature one is so often confronted with in shells of this type. Finally, on dissection, one (richilaensis) was found to be a Macrochlamys with the characteristic shell-lobes, the other (bhutanensis), above described, had none, and, besides, very different genitalia with no amatorial organ, thus representing two quite distinct genera]

[Subfamily HELICARIONINÆ

Helicarionine, Godwin-Austen, Mol Ind i, 1883, p 146

Typical genus, Helicarion, Fér.

Range Australia, Indo-Maiay, Japan, China, islands of the

Pacific, and westward to Siam, Burma, and India.

This large subfamily contains many well-defined and interesting generic divisions The similarity of the shells of many species to those of the palearctic genus Vitrina led at first to their being placed by authors in that very distinct genus. The animal has broad shell-lobes more or less covering the shell, and a tail-gland is characteristic of the subfamily. The generative organs are simple, the amatorial organ absent in many The jaw is oxygnathous The radula ranges from one similar to that of the Macrochlamyma, with teeth 80-100 in the row, laterals bicuspid, occasionally tricuspid, to another with very numeious teeth, as many as 300-400, in the row, of simpler form, with a minute central tooth, and approaching but not so pectinated as those of the Durgellina. The animals differ widely from each other in the different genera The shells are of a rudimentary type, thin, delicate, few-whorled, and are of little use in generic determination]

[Genus HELICARION.

Helicarion, Fér Prod (Hist Nat) p 23 (1821). Austenia, partim, Godwin-Austen, Mol Ind i, 1883, p. 148

Type, H cuvieri, Fér, from Australia

Range Indo-Malay and Australasian Regions.

In the type genus the animal has the keel of the foot flattened In the generative organs the amatorial organ is absent, the penus is attenuate, a long epiphallus and a very long kalc-sac. The shell of 2½ whorls, the last much expanded and more closely wound near the protoconch than in the Indian forms of the subfamily.

In Helicarion various authors have placed quite a large assemblage of species, some of which, as the animals have become known, have very rightly been made the types of new genera. The shells vary in form from that of the type species H. cuvieri, and while all are thin, more or less membranaceous, some are even helicoid with high spire and with four or five whorls. South-African forms placed in Helicarion, such as H.hudsoniæ, Benson, depart much from the typical form. Perhaps the most distinctive group are those

N 2

possessing a solid or tubular calcareous dart, of which Parmarion of Java &c may be taken as the type None have hitherto been recorded from India, but they may be looked for in Eastern Burma Many such genera are now known (Parmarion, Microparmarion, Collingea, Wicgmannia, Parmunculus, Cryptosemelus, Philippinella, Parmella, &c) which might well constitute a subfamily—the Parmarioninae Genera such as Damayantia, also having calcareous darts, approach species of the subfamily Durgellinae, the radula having very numerous and similar teeth in the low

In Parmarion and allied forms, such as Damayania, the development of the mantle which envelops the shell in life appears to have had its origin on the margin of the mantle-zone, and extended from its periphery equally and inwardly to the central shit in some and carried further to a complete covering in others. It has not been derived from distinct right and left shell-lobes as in Austenia and Girasia, and these terms are not therefore applicable.]

[Genus CRYPTAUSTENIA

Cryptaustenia, Cockerell, A. M. N. H. (3) vii, 1891, p. 90 (no description as a section of Helicarion), id Nautilus, xii, 1898, p. 10

Type, C succinea, Reeve

Range. Sikhim and Eastein Himalaya, Lower Bengal and to

Cachar]

Shell imperforate, thin, diaphanous, smooth, depressed, whorls 3_41, rapidly increasing, the last large and rounded, aperture large, oblique, peristome simple, more or less membranaceous

The animal has the shell-lobes of the mantle broad but divided from each other and almost or quite concealing the shell when fully expanded. The dorsal lobes cover much less of the back of the foot than in the latter genus. Peripodial groove and mucous pore strongly developed, a projecting lobe above the latter Genitalia chiefly distinguished from Macrochlamys by the absence of a coil for the attachment of the retractor muscle of the penis. Radula with a tricuspid rhachidian tooth and rather numerous broad inner laterals bi- or tricuspid, together with a much smaller number of outer pointed bicuspid laterals than in typical Guasia, and the outer cusp of these is outside remote from the end

This group is at once distinguished by its shell from Girana and Austenia It chiefly differs from Vitrina by having a mucous

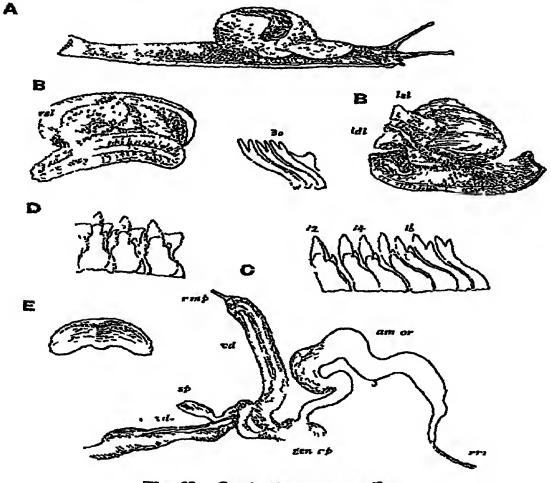
pore, and the genitalia are quite different

a Species from the Eastern Himalayas

277 Cryptaustenia succinea, Rv (Vitima) Conch Ic Vitima, 1862, pl 11, tig 8, H & T (Vitima) C I 1876, pl 75, tigs 7, 10 Vitima planospiia, Bs A M N H (3) 111, 1859, p 271, Pfr Mon Hel v, 1868, p 14, Godwin-Austen (Austenia), Mol Ind.

1, 1883, p 149, pl 36, figs 1-5 (animal and shell), pl 38, figs. 1-1 b (anatomy). id 11, 1899, p 93, pl 91, fig 4 (dart-sac), id (Eurychlauvs) t c 11, p 109, Cockerell (Cryptaustenia), A, M N H (6) vii, 1891, p 99, id Nautilus vii, 1898, p 10 nec V planospira, Pfi 1853

Shell otately depressed, periphery roundly oval, thin, smooth, not highly polished, translucent, horny, spire convex, flat above,



[Fig 63 - Cryptaustenia succinea, Rr

- A Animal drawn from life Nat size
- B Animal from a spirit-specimen viewed from the right and left sides × 2
- O Genitalia ×7
- D Feeth of the radula × 328.
- E Jaw × 105]

apex not exserted, suture shallow; whorls 3, rapidly increasing, the last descending very slightly near the aperture, rounded at

the periphery, convex beneath; aperture oblique, ovately lunate, margins converging, the upper curved forward, columellar deeply sinuate

Major diam. 14, min. 11, height 6 mm. A large variety measures 19½×15½×8 mm

Hab. Sikhini at low elevations, Pankabari, Rangun Valley, Nampok, Rangpo near Tumlung, Damsang Peak, Daling District, Bhutan

A drawing of the animal by Stoliczka is published in Godwin-Austen's 'Mollusca of India,' and shows that the resemblance to C benson: is very great. There are the same broad shell-lobes, strongly papillose, covering the greater part of the shell. The foot has a linear gland behind with a slight overhanging lobe, and the sole is divided into a central area with two lateral margins. The teeth of the radula are thus arranged 50 1 14 1.14.1 50 (65.1.65), and resemble those of Macrochlamys indica

The animal in most of its characters clearly resembles Eury-chlamys platychlamys, and is accordingly placed in the genus Eurychlamys by Godwin-Austen The shell, however, differs considerably. The present form has a dart-sac, which E platychlamys wants, but this may not be a very important difference

278 Cryptaustenia ovata, H Blf (Helicarion) J A. S B 1871, 2, p 44, pl 2, fig 9, Pfi (Vitrina) Mon Hel. vii, p 10, Godwin-Austen (Helicarion), J A S B 1876, 2, p 312, Nevill (Helicarion), Hand-l 1, 1878, p 14

Shell depressed with an ovate periphery, diaphanous, dark horny, smooth, polished, spire almost flat, apex scarcely exserted, suture impressed, whoils 3½, rapidly increasing, the last slightly descending, aperture oblique, ovately lunate, margins converging, upper margin of peristome arcuate, columellar regularly sinuate, subvertical

Major diam 115, min 9, alt 5 mm. Another specimen

measures $135 \times 10 \times 6$ mm.

Hab Near Darjiling (Stoliczka) Other localities in Bengal, mentioned by Nevill in his 'Hand-list,' are, as Godwin-Austen has shown, very probably due to this shell being confounded with

A. panchetensis

"Distinguished from H salius, Bs. sp. (with which it is associated), by its larger size, more depressed form, and simple peristome, not recurved at the columella. On the other hand, it is smaller, more solid, and more globular than H. planospira, Bs. sp. From H scutella, Bs. sp., and H bensoni, Pfr. sp., it differs by its greater solidity, its highly polished surface, and the less rapid increase of the last whorl. It is also smaller than the former of these species."

It is far from improbable that this shell also belongs to the

genus Dv1 gella

279. Cryptaustenia heteroconcha, H Blf (Helicarion) J A S B. 1871, 2, p 45, pl 2, figs 8-8 b, Pfi (Vitrina) Mon Hel vii, 1876, p 10, H & T. (Vitrina) C L 1876, pl 152, figs 8, 9

"Shell much depressed, with an oval periphery, thin, diaphanous, membranaceous beneath, yellowish horny, greenish towards the aperture, polished, arcuately obsoletely striate, irregularly subcostulate towards the aperture, spire flattened, the apex scarcely exserted; whorls 3, rapidly increasing, the last dilated, scarcely descending; suture subimpressed, margined with white, aperture very oblique, oblong-ovate; anterior margin of the peristome strongly arcuate, right margin subundulate, basal margin membranaceous

"Major diam. 17, mm 11, axis 5 mm. Height of aperture 8, breadth 11 mm.

"Hab Near Darjiling." (H. F. Blanford, in Latin.)

The height of the shell in the figure, measured from the base, is about 8 mm.

280. Cryptaustenia verrucosa, Godwin-Austen, Helicarion (Hophites), J. A. S. B. 1876, 2, p. 313, pl. 8, fig. 5 [Vide tig. 64 A, p. 184]

Shell thin and glassy, with about 4 whorls

"Animal dull purplish grey, mantle-lobes, which can cover the entire shell, are very minutely mottled, and have a finely papillate surface. On the posterior margin are six blunt and wart-like processes, arranged three on the right and three on the left side... The mucous gland is larger and the upper lobe well pointed... The mantle is divided into three lobes, one of rectangular outline is on the anterior left margin. The shell when the animal is in motion is very slightly exposed.

"Total length 1.25", mantle 0 60", mantle to extremity of foot

0 50", tentacles 0 20".

"Hab. Under Toruputu Peak at 4000 feet. Found on decaying

wood during damp weather." (Godwin-Austen)

The animal, well figured in the original paper, is evidently similar to C. benson: and C. succinea, and has the same papillose shell-lobes.

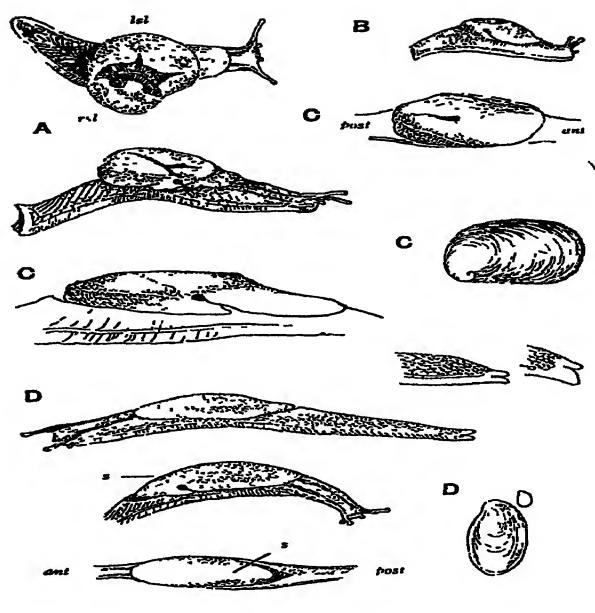
[281. Cryptaustenia durrangensis, Godwin-Austen (Austenia), Mol Ind 11, 1907, p 172, pl 108, figs 5-5 b (shell), pl 111, figs 7-7 c (part animal and radula)

Durrang District, Assam

Shell depressedly globose, not umbilicated; sculpture none, surface glossy, crossed transversely by fine lines of growth; colour straw-colour; spire very low, rounded, suture shallow, whorls 2½, expansive; aperture very oval, oblique, peristome thin, narrowly edged with white, columellar margin nearly vertical

Size major diam 105, alt axis 38 mm

Animal (from a soaked specimen) Colour olivaceous with mottlings on the foot, the membrane of the branchial cavity has



[Fig 64

- A Cryptaustema terrucosa, viewed from above and the right side drawn from life
- B Girusia cinerca, drawn from life
- C Austenia nagaciers sketch from life of upper side of the mantle, and the right side to show the shell-lobes and shell of same

 D Cruptognana rubra the animal from different sides, extremity of foot enlarged, drawn from life, shell magnified and natural size]

a margin of black on the side of the elongate kidney and the visceral sac is daikly mottled. The mucous gland linear, extremity of toot square. Shell-lobes black, the right shell-lobe broad and spreading along the side of the body-whorl, the left shell-lobe also a broad lappet and elongately triangular in shape. The male organ resembles that of Austenia gigas, and the amatorial organ is larger

Jaw with a very small central projection.

Radula has the formula

The central tooth and the admedian teeth are of the usual form the central tooth as drawn is malformed or broken, it is only the remnant of the usual tricuspid form, the laterals are evenly bicuspid.]

[282 Cryptaustenia zemoensis, Godwin-Austen (Austenia), Mol Ind ii, 1907, p. 171, pl. 107, figs 4-9

Locality. Zemo Samdong, Sikkim (W. Robert)

Shell rather depressedly globose, thin and membranous, sculpture none, a smooth shiny epidermis, colour ochraceous with a green tinge; spile low, lounded, apex just raised above the next whorl; whoils 3, gradually increasing, the last rounded and tumid, aperture and peristome not seen (broken below).

Its form is very similar to a species from Darjiling in Di. W. T. Blanford's collection, figured on pl 37, figs 2, 2a, vol. i. p 152 (Mol Ind), as Austenia? salius, Bs, var, a smaller or more

solid shell

Size major diam 11.3, alt axis 6 mm

The shell is of the type of A planospira, but may be distinguished at once by the coil of the whorls, there being more of them. The shell is so thin and delicate, I found it impossible to

detach it from the animals preserved in spirit

Animal Of similar form to A. planospina; the principal difference is noticeable in the shell-lobes, which in this species are quite smooth, whereas in planospina they are strongly papillate. The left shell-lobe shows a scalloped edge, with furrows running inwards towards the edge of the mantle. The left dorsal lobe is distinctly in two parts. The sides of the foot and mantle-lobes are mottled, but not strongly, and one specimen shows this only slightly on the shell-lobes. The sole of the foot is divided, but the segmental lines on the side do not extend across the central portion as in A gigas and other species. The fringe of the foot is paler than the rest of the animal, from the peripodial groove to the edge of the foot

The generative organs are interesting, because in the penis there is a solid coiled rounded mass at the main bend, from which the retractor muscle is given off, and in this respect this species shows an approach to Macrochlamys, yet again in this connection there is also a well-developed kalc-sac or flagellum at the point of junction of the vas deferens. The amaterial organ is short and blunt at the outer end, in this respect it is like that seen in the genitalia of Austenia planospina. The spermatheca is apparently long, only a part, perhaps half, is left, a portion having been broken off in dissection.

The jaw was arched, solid, and with a strong central projection.

The radula has the formula.

The teeth are similar in form to those of *C bensoni* of Calcutta, the outer cusp lying low down, up to the extreme marginals.]

[283. Cryptaustenia silcharensis, Godwin-Austen (Austenia), Mol Ind ii, 1907, p. 170, pl. 107, figs 1-3 c (shell, animal, and anatomy)

Locality. Near Silchar, Cachar (F. Ede).

Shell. The description of C. benson: will apply generally It is bright and shining, of a straw-colour Three whorls, these are flatter above than in that species, making the aperture wider horizontally to the axis; viewed from above, the last whorl spreads and widens outwards as it nears the aperture.

Size maj. diam 0 95, alt axis 0.35 mm

Animal Preserved in spirit is pale vinous, greyer on the shell-lobes; on the side of the foot, just above the peripodial groove, are a series of isolated dark blotches. The foot is long behind, narrow compressed at the sides, and terminating in a long booked point overhanging the narrow slit of the mucous gland. The sole is very distinctly divided. The peripodial groove and margin not so distinctly marked as in some species. The right and left shell-lobes are remarkably developed, particularly the former, broad and expanding, in life evidently covering the whole shell, they have a beautiful papillate surface. The length of this specimen (contracted) is 2 25 mm

Generalia The amaterial organ is long and cylindrical, tapering gradually to the retractor muscle. The penis is bent sharply where the long retractor muscle is given off, then there is a short swollen part where the spermatophore would be formed, and this narrows to the was deferens. The spermatheca is moderately

long

The jaw has a central projection.

The radula has the formula

Similar to that of C bensons, and the teeth are of the same tricuspid type shown in plate 38, fig. 2, vol 1, Mol. Ind]

284 Cryptaustenia globosa, Godioin-Austen, Helix (Nanina), J A S B 1876, 2, p 312, ad (Austenia) Mol Ind i, p 153, pl 37, ngs 5-56 (shell)

Shell depressedly subglobose, thin, transparent glossy, scarcely striated, whitish horny, spire slightly raised, suture impressed; whorls 31, convex, the last not descending above, broadly rounded at periphery, expanded below; aperture oblique, lunately circular; maigins converging, columellar roundly sinuate.

Major diam 94, min 71, height 51 mm.

Hab. Summit of Toruputu Penk, Dafla Hills, north of Assam (Godwin-Austen)

More globose and with a rounder mouth than the allied forms. Animal dark giey, with the lobe over the gland much hooked.

b. Species from Bengal

285 Cryptaustenia bensoni, Pfr (Vitrina) P Z S 1848, p 107, id (Vitrina) Mon Hel ii, 1848, p 497, H & T (Vitrina) C I 1876, pl 65, figs 1-4, Godwin-Austen (Austema), Mol Ind 1, 1883, p 150, pl 36, figs 6, 7 (shell and animal extended) Austenia bensoni, car sylhetensis, Godwin-Austen, l c pl 38, fig 3

Shell depressed, thin, faintly striated, polished, translucent, pale horny; spire scarcely raised, obtuse, suture very slightly impressed, whorls 3½, slightly convex, the last scarcely depressed; aperture oblique, lunately suboxate, peristome simple, thin, the margins converging, the upper slightly curved forward, the columellar sharply curved upwards, inclined forward beyond the vertical.

Major diam. 10, min. 8, depth 5½ mm (The original type measured $12 \times 9 \times 6$ mm.)

Hab Bengal, Calcutta, Jessore, Chandanagore Not rare in

the Botanic Garden, Calcutta

Animal dull greenish grey or very pale olive with some large irregular blotches, sole of foot white in the middle, dusky on each side The shell-lobes of the mantle almost or entirely cover the shell and are rough, being covered with small papille. The teeth on the radula are: 45.3.12.1.12.3.45 (60.1.60); all the 15 inner laterals are tricuspid, the outer bicuspid and pointed, the second outer cusp not being near the end.

Godwin-Austen has described as a variety C. bensoni, var. sylhetensis, from a wood on the banks of the Soorma River in Sylhet, between Atgaon and Chatak. Although the shell does not differ greatly, the radula has 64.2.14.1.14.2 64 (80.1.80) teeth, the outermost of which show signs of pectination, as in Dingella. The animal is light yellowish green and creeps about with the caudal termination of the foot raised in the air

296 Cryptaustenia panchetensis, Godum-Instin (Austenia), Mol Ind 1, 1883, p 153, pl. 37, figs. 3-3 b (shell).

Shell very similar to C benson, but the shell is thicker, and the last whorl descends near the aperture

Major diam. 103, min 8, height 5 mm

Hab Panchet Hill, W. of Rangany, Bengal (W T B). Godwin-Austen suggests that specimens from Rajmahal, Sikrigali, and Patna in Bengal, referred by Nevill in his 'Hand-list' to A orata, may be the same as the Panchet shell

Genus EURYCHLAMYS

Eurychlamys, Godicin-Austen, Proc Malacolog. Soc vol in, July 1899, p 250 (no description), id Mol Ind 11, 1899, p 90

Type, E platychlamys, W T Blf Range Southern India and Ceylon

Original description:—"The shell-lobes are elongate and broad, more or less papillate, enveloping the shell. The left dorsal is divided into two lobes, the posterior one narrow. Lobe above mucous gland overhanging. Foot long and narrow behind, the sole with a simple straight sheatli, the retractor muscle attached at the end, and above a small bulbous enlargement where the was deferens joins. The amatorial organ is absent. The jaw has a central projection. The central tooth is tricuspid, the admedian bicuspid, the laterals evenly bicuspid (from 70 to 60 on each side)."

287 Eurychlamys platychlamys, Blf J A S B 1890, 2, p 195, pl. 2, fig 9, Godicin-Austen (Eurychlamys), Mol Ind 11, 1899, p 90, pl 81, figs 1-1 e (animal and anatomy)
Namina (Microcystina) perrotteti, Peile, Jour Bomb N H Soc. 71, p 134 (1897). nec Pfeiffei

Shell openly perforate, conoidly depressed, thin, smooth, polished, translucent, fullous horny; spire low, converty conoidal, apex obtuse, suture scarcely impressed, almost flat; whorls 5, slightly convex, the last rounded at the periphery, convex beneath, aperture oblique, subovately lunate, peristome thin, outer margin sinuate, basal straight, columellar oblique, slightly expanded throughout, more broadly above.

Major diam. 11, min 9½, height 5½ mm (a large specimen

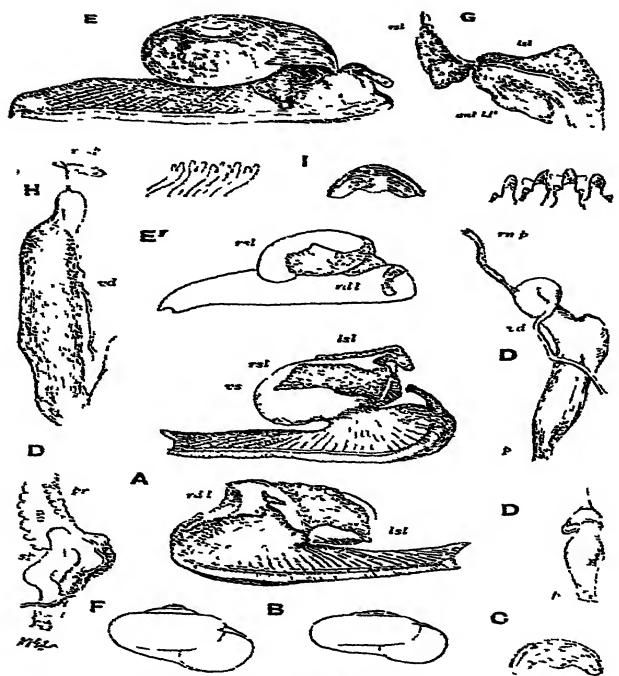
measures 14×12×61 mm)

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Hab. Bombay and neighbourhood.

A variety larger and with a lower spire occurs at Champanir, near Broach. A shell measures $16 \times 13\frac{1}{2} \times 7$ mm, others are even larger.

The animal is dark grey and has remarkably broad shell-lobes, which cover a great part of the spire, sometimes nearly the whole,



[Fig 65 - Eurzehlungs platiel lang .

- A Animal with shell removed viewed from both the right and left $\times 45$
- sides, showing the shell- and dorsal lobes. Shell $\times 24$ O Jaw O Jaw × 12 × 45 and × 12 × 12 Shell Different parts of the genitalia

Eusschlamye regulata

- E. Ammil (spirit-specimen) seen from right side ×34 shell-lobe turned down, showing inside surface

 E. Ditte. ×25 Showing position of right shell-lobe in life

 F. Shell ×24 G. Lobes of the manule ×3
- E. Ditte. F Shell
- H The penus H The pents $\times \delta$ I. Jaw and teeth of the radula $\times 12$ and $\times 368$.]

with one cusp on the outer side, outer laterals with two even terminal cusps as usual in Macrochlamys

To this genus may belong such forms as umbina, nepas, woodiana, &c, provisionally placed in Macrocklamys]

Genus AUSTENIA

Austenia, Neull (subgenus of Helicarion), Hand-l 1, 1878, p 16, Godivin-Austen, P Z S 1880, pp 294, 298, ad Mol Ind 1, 1883,

p 148, 1888, p 228
Girasia, partim, Godwin-Austen, Mol Ind 1, 1888, p 216
Cryptibycus, Cocke ell, A M N H (3) vii, 1891, p 99, id Nautilus, aii, 1898, p 10 (no description)

Type, A gigas, Bs.

Range The Himalaya, Assam, and Burma

Shell imperforate, ovate, of one to two whorls, very thin as a rule, often glassy, aperture very large, more or less ovate; peristome

thin, almost membranaceous

Animal large, not retractile within the shell The lobes of the mantle are united around the shell, and when the animal is extended they cover much of the anterior part of the foot and the greater part of the shell Each shell-lobe is roundly expanded upon the shell, not elongate as in Maciochlamys In some forms, as A. magnifica, the shell is nearly or quite concealed by the mantle-lobes, as in Girasia, while in the type a considerable portion remains exposed

Hinder extremity of foot long, sharply carinate above and truncate behind by a large linear mucous pore, above which there is sometimes an overhanging lobe. Peripodial groove very distinct

Sole of the foot divided into three longitudinal areas.

Genital aperture, as usual, behind the outer base of the right The details of the generative organs much resemble those of Macrochlamys, except that near the retractor muscle of the male organ there is neither excum nor coil. A large dart-sac

is present and a long cylindrical spermatheca.

In the radula, which much resembles that of Macrochlamus, the rhachidian is tricuspid, and the admedian teeth are broad and bicuspid or tilicuspid The outer laterals are long and pointed, with an additional cusp low down on the outer margin, and which disappears on the outermost teeth. This differs from the form of the outer marginals in Girasia.

The genus Austenia is intermediate between Macrochlamys and Girasia and distinguished from all by its ovate eni-shaped shell It is less slug-like than Girasia, its shell being well formed and, as a rule, less covered by the mantle. It is represented in the Indian Peninsula by the genus Pseudaustenia, which has a similar

shell, but several differences in the animal

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289. Austenia gigas, Be (Vitrina) J. A. S. B. v, 1886, p. 350, ? Pfr (Vitrina) Mon. Hel. ii, 1848, p. 496, Bif (Vitrina) J. A. S. B. valv, 2, 1865, p. 95, Godwin-Austen (Helicarion), J. A. S. B. 1875, p. 6, pl. 3 (animal extended), H. & T. (Vitrina) C. I. 1876, p. 29, pl. 66, hgs. 2, 3, Nevill, Helicarion (Austenia), Handli, 1878, p. 16, Godwin-Austen, P. Z. S. 1880, p. 294, pls. 24, 25, 26, 27, id. Mol. Ind. i, 1883, p. 148, 1888, p. 228, pl. 55, figs. 3-4b (shell and animal), pl. 60, figs. 1, 1 a. (animal extended), pl. 62, fig. 8 (radula), vol. ii, 1899, pls. 89, 90 (genitalia)

Shell thm, polished, subovately depressed, faintly striated, olivaceous horny, spire small, flat, projecting beyond the peristome,

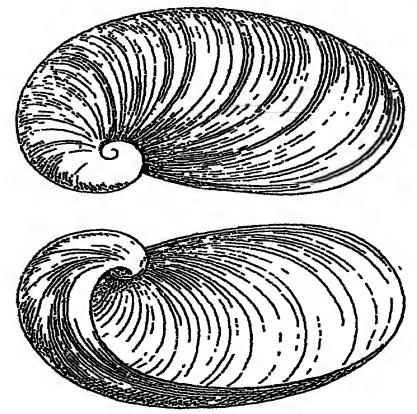


Fig 66 -Austenia gigas, Bs

suture impressed, whorls about 2, very rapidly increasing, the last depressed above, occupying the greater part of the shell, aperture very large and oblique, ovate, the margins nearly meeting, the columellar strongly arcuate

Major diam 30, mm 17, alt 10 mm A large specimen

measures $40 \times 25 \times 12$ mm

Hab Khasi Hills, common about Teria Ghat Allied species in Arakan Range, west of Prome, and Kyouk Phyu and Ramri Island.

Austenia 193

The length of the animal, when fully extended, is about 6 inches. A considerable portion of the shell remains exposed (this doubtless varies in extent). The teeth of the radula are thus arranged 69.3.22.1.22 3.69 (94.1.94), the number of broad inner lateral (admedian) teeth being very large. The rhachidian tooth is bluntly tricuspid, the next 6 on each side have

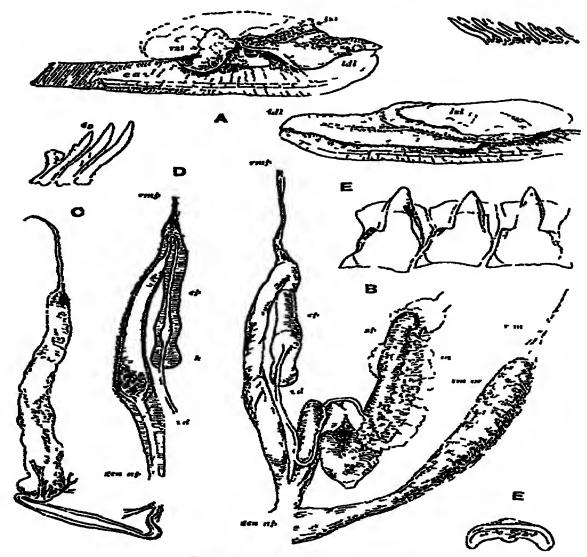


Fig 67 —Austenia gigas

A. Animal from a spirit-specimen, viewed from both the right and left sides, showing shell- and dorsal lobes, in the former, cav is the posterior end of the cavity in the foot occupied by the internal organs

B Genitalia the spermatheca filled with spermatophores

O A spermatophore taken from the spermatheca
D Penus, showing spermatophore in process of formation
E Jaw and teeth of the radula

only a blunt outer cusp, afterwards an inner cusp becomes visible. The outer laterals bicuspid, with a long point and an additional cusp low down on the outer side; the extreme marginals are simple unicuspid teeth.

The general colour of the animal as represented in the figures is an umber-brown, the furrows on the upper surface being

darker.

290. Austenia butleri, Godwm-Austen (Girasia), Mol Ind 1, 1888, p 226, pl 60, fig 7, id op cit. 11, 1899, p 108, pl 90, figs 5-10 Helicarion gigas, Bs, small var, J A S B xliv, 1875, p 6, pl 3 (smaller figure, animal extended)

Austenia gigas, ide minor, Godwn-Austen, P Z S 1880, p. 294.

Austenia gigas, var minor, Godwin-Austen, P Z S 1880, p 294, pl 24, figs 3-6, 9, pl 25, figs 1-5, pl 26, figs 1, 5, 8, pl. 27,

figs 8-10 (animal, shell, and anatomy).

This differs from A gigas in smaller size and in the different colour of the animal, which is "dark ochre-brown, with very dark

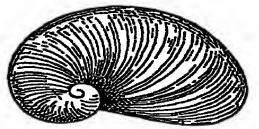


Fig 68 -Austema butlers

marking, particularly noticeable along the margin of the foot" The neck-lobe of the mantle is represented as spotted in the figure and a broad dark line in front of it, down each side of the neck. Animal represented as about 3½ inches long when extended.

Major diam. of shell 21 5, min. 18 mm.

Hab Between Samuguting and Kohima, Naga Hills (Godwin-Austen)

Teeth in the radula 32 3.18 1.18.3.32 (53.1.53), or considerably fewer than in A. gigas

*291. Austenia resplendens, Nevill (Helicarion), J A S B xlvi, 2, 1877, p 23, id Yunnan Exped, Mol p. 883, pl 80, figs 6, 6 a, id J A S B 1, 1881, 2, p 129, pl 5, fig 24, Nevill, Helicarion (Austenia), Hand-l 1, 1878, p 16, G Tapp Canefri, Ann Mus Civ Gen xxvii, 1889, p 315.

This is described as resembling A gigas, but as being a little thinner and more membranaceous, it is at once distinguished from it by its flatter, more ear-like, and appressed shape.

Major diam. 22, min. 14, depth 8 mm

Hab. Sawady and Bhamo, Upper Burma (Dr. John Anderson).

Judging by the figure, this shell appears to have about half a

revolution more than A. quas.

*292 Austenia venusta, Theobald (Vitrina ^p), J A S B 1870, 2, p 400, Pfr (Vitrina) Mon Hel vii, 1876, p 512, H & T. (Vitrina) C I 1876, pl. 152, fig 5, Godwin-Austen, Mol Ind. 1, 1888, p 287, pl 59, fig 5 (shell)

"Shell ovately ear-shaped, scarcely convex above, diaphanous, very thin, polished, subrugosely stricted, bright yellowish brown; whorls 1½, rapidly increasing, aperture very broad

"Major diam. 30, mm 17, height 10 inch $(7\frac{1}{2} \times 4 \times 2\frac{1}{2})$ mm) "Hab Near Chuegaley Tsekan, between Prome and Tongoop."

(Theob. in Latin)

The figure shows that this is very similar to A gigas, though only about a third the size, and it may be the young, as A gigas is said to be found in the Arakan Range. The shell from Ponsee in Yunnan, referred to this species by Nevill (J. A. S. B. 1877, 2, p. 24), is shown by Godwin-Austen to be different

*293. Austenia magnifica, Godwin-Austen & Newll (Helicarion), JASB 1877, 2, p 24, Nevill, Helicarion (Austenia), Hand-li, 1878, p 16, Godwin-Austen, PZS 1880, p 294, pl 24, figs 1, 2 (animal); Nevill, Helicarion (Austenia), JASB 1881, 2, p 129, pl 5, fig 23 (shell), Godwin-Austen (Girana), Mol Ind 1, 1888, p 225, pl 56, figs 1, 2, 3 (animal), 4, 5 (shell) Helicarion (Austenia) feæ, Canefri, Ann Mus Civ Gen xxvii, 1889, p 313, pl 9, figs 1-7

Shell very similar to that of A. gigas, but much larger, c. a brown, not a green colour, with the body-whorl much more flatly expanded, and the spire less convoluted and more depressed, also, looked at from underneath, very much less of the reflected body-whorl is visible.

Major diam. 46, axis $11\frac{1}{2}$, aperture $40\frac{1}{2}$ by $29\frac{1}{2}$ mm

Hab. Teng-Yue-Chow or Momein in Yunnan, at 5500 feet

(Anderson); near Bhamo (Fea).

The lobes of the mantle are united around the shell, which is completely covered when the animal is alive, and only a small portion exposed when the mantle is contracted in spirit. The line uniting the shell-lobes is distinctly seen. The mantle also covers much of the upper surface of the foot. [In this respect the animal is like that of *Girasia*, and is the reason why I placed it in that genus, the shell being different.] Mucous pore very long; spermatheca, as figured by Tappone Canefri, is very large; other generative organs as in *Girasia* generally.

In the radula the teeth of the middle row are as usual; the outer laterals bicuspid, long, curved, and pointed the outer cusp

much below the apex

294 Austenia nagaensis, Godwin-Austen (Helicarion), JA & B. xliv, 2, p 5, pl 2, figs 3-3c (shell and parts of animal), id. (Girasia) P Z & 1880, p 294, id (Girasia) Mol Ind i, p 224, pl. 61, figs 3-3c (shell and parts of animal).
[Vide fig. 64 C, p 184]

Shell very thin, membranaceous, ovate, apex forming a coil, not

o 2

projecting from the side; much broader than Girasia hooken, covered with an olive epidermis showing lines of growth

Major diam. about 22, min about 14 mm

Animal ochre-colour, pretiily mottled and dotted with a darker shade of the same, the mantle covers nearly the whole shell, a narrow white line commencing near the posterior margin of the slit disclosing the shell extends round towards the respiratory orifice on the right-hand side, and in front another line curves round to the left anterior side. Length about 3 inches

Hab. Angami Naga Hills, Assam.

295. Austenia cacharica, Godwn-Austen (Girasia), Mol Ind 1, 1888, p 240, pl 59, figs 4, 4 a (aumal and shell), pl 62, fig 5 (teeth) Helicarion solidum, Godwin-Austen (partim), J A S B 1875, 2, p 6, pl 2, figs 5-5 c (animal and shell), nec P Z S 1872, p 518

Shell oval, fairly solid, smooth, shining, colour pale olive, aper small, not projecting, very closely wound; whorls about 1½, aperture ovate, occupying nearly the whole shell, only about a ninth being taken up by the reflected whorl, columellar margin evenly sinuate

Major diam 11, min 6½, height about 3 mm

Hab. North Cachar Hills Kohima, Dunsin Valley.

Animal dark umber to pinkish grey, much speckled throughout, and with black lines on the side of the foot. Dorsal lobe ample, extending round to the left posterior side; right dorsal lobe rather small. The right shell-lobe is expanded over the apex, but is hardly connected behind, the left shell-lobe is narrow and laps over the peristome, but does not join the other lobe. The posterior margin and apex of the shell rests in a V-shaped depression of the ridge of the foot, and the hinder part of the foot thence to the mucous gland is very short.

The teeth of the radula are thus arranged 40 15 1.15 40 (55 1 55) The inner laterals (admedians) have a well-formed cusp on the outer basal side, the outer laterals are very pointed

and curved, with the outer cusp quite basal

296. Austenia solida, Godwn-Austen, Helicarion (Hoplites), P Z S 1872, p 518, pl. 30, fig 10 (shell), H & T (Vitrina) C I 1876, pl 152, fig 6, Godwn-Austen (Girasia), Mol Ind i, p 241

Shell close to A. cacharica, but considerably stronger and the apex thicker. The columellar margin of the peristome is much incurved

Major diam 141, min. 9, height 41 mm A smaller specimen

measures 9 mm in major diameter

Hab. Hengdan Peak, North Cachar Hills

This may be the same as the last, but the shell shows slight differences. The animal is not known.

197

297. Austenia peguensis, Theobald (Vitima), J. A. S. B. Main, 1864, p. 244, H. & T. (Vitima) C. I. 1876, pl. 65, figs. 2, 3, Nevill, Helicanon (Austenia), Hand-l. 1, 1878, p. 16, Godwin-Austen (Girasia), Mol. Ind. 1, 1888, p. 227, pl. 59, figs. 6-6 b. (animal), 6 c, 6 d. (shell); Collinge (Girasia), Jour. Mal. 12, 1902, p. 76

Shell rather more solid than usual, semiovate, with the apex, which is very thick, projecting, polished, pale olivaceous or yellowish, spire flat, suture rather deeply impressed, about 1½ whoils, apeiture occupying almost the whole lower surface;



Fig 69 - Austenia pequensis

margin of peristome very convex, except near apex, where it is straight or slightly concave, inner portion of deeply concave columellar margin thickened in some shells.

Major diam. 16, min 10, height 3½ mm

Hab Pegu. Near the town of Pegu, and also on the west of the Irrawady in the Bassein district, and probably in the Arakan Hills farther north; Meetan, Tenasserim (Fea); also, according to

Collinge, the Malay Peninsula, Belimbing, State of Ligeh.

The animal has a granulate mantle, the shell-lobes almost completely covering the shell when expanded. The mantle and its lobes are exactly as in Austenia gigas. The posterior part of the shell rests in a depression of the hinder part of the foot, though this is not so distinctly V-shaped nor so deep as in Girasia hooker: Colour brown, mantle greyer and mottled, sides of the foot speckled with dark grey. Length of animal (when crawling) about 3 inches. Jaw and radula as in Austenia gigas. Teeth of radula 32.3.18 1 18 3 32 (53.1 53)

298. Austenia shanensis, Godwin-Austen (Girasia), Mol Ind ii, 1899, p 107, pl 91, figs 3-3 a (shell and animal)

Shell ovate, convex above, polished, olivaceous horny; apex solid, flat, projecting less than in A pequensis, suture impressed, whorls 1½, aperture ovate, covering nearly the whole of the shell

beneath, margin of peristome convex almost throughout, becoming straight on margin near apex only.

Major diam. 11, min. 7, height 3 mm

Hab. Shan Hills, Burma, east of Fort Stedman (Woodthorpe)

Animal dark grey, similar in form to Austenia pequensis. In the odontophore the inner laterals are bicuspid, the outer cusp far below the apical as in A. gigas, the outermost laterals small and unicuspid.

*299. Austenia sikkimensis, Godioin-Austen, Girasia (Ibycus), Mol Ind 1, 1888, p 239, pl 59, figs. 2, 2a (animal), 2b (shell), Cockerell (Girasia), A. M. N. H. (6) vii, 1891, p 106

Girasia (Ibycus) sikkimensis, tai mainwaringi, Godwin-Austen, Mol Ind. 1, 1888, p 240, pl 59, figs 3, 3 a, 3 b (animal), Nevill, Hand-l 1, 1878, p 16, no. 37, H. (Austenia) n. sp.

Shell (from figure) ovate, the apex small, not projecting, much resembling the shell of Austenia cacharica.

Major diam. 94 mm. (from figure)

Hab Independent Sikhim, 9500 feet; Chungthung, on the

Chakang Stream. Var. mainwaring: from Darjiling

"The animal, from the spirit-specimen, appears to be of a pinkish grey when living. The mantle finely papillate and finely sprinkled with small black spots, a few similar distant markings on the side of the foot behind."

The var. mainwarings must have been very dark-coloured when living, the mautie-lobes are finely papillate throughout. The foot

is very short behind and cut off square.

In the odontophore the middle tooth of the radula is strongly tricuspid, the inner laterals as usual, the outer as in gigas, bicuspid, the inner point much longer than the other. The

extreme outside laterals are very small

This species has been regarded as allied to (or identical with) Ibyous fissidens, Heynemann, but the teeth of the radula appear to be very different [The teeth of I. fissidens are very similar to those of the genus Leptodontarion of Sarasin]

Genus GIRASIA.

Girasia, Gray, Cat Pulm Birt Mus p. 61 (1855), Godwin-Austen, Mol Ind. 1, 1888, p 216 Hoplites, Theobald, J A S B xx 111, p 244 (1864)

Type, G. hookers, Gray

Range. Himalayas and Assam.

Shell ovate, usually membranaceous, with a more or less thickened apex, sometimes rudimentary, usually with an olivaceous epidermis, apex white.

"Animal slug-like, long, mantle largely developed, shell and dorsal lobes are united all round, and the shell is entirely covered

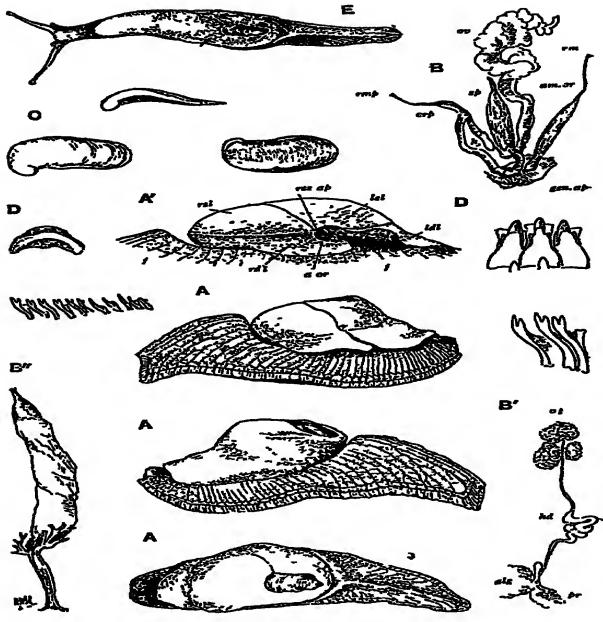


Fig 70 — Girasia hookers, Gray

- A View of right, left, and dorsal sides drawn from a spirit-specimen A nat size
- Position of shell- and dorsal lobes Nat size The former grown together on the line running from the res-ap, left dorsal lobe turned back to show the position of the respiratory and anal orifices enerative organs 2 nat size B' Spermatophore
- Generative organs 2 nat size
- B' Do, part of X3
- C The shell A nat size.
 - alg Albumen-gland

 - a or Anal orifice am or Amatorial organ
 - crp Cæcum of the retractor penis Foot.
 - Kalc-sac
 - gen ap Generative aperture ldl Left dorsal lobe

- Spermatophore
- Jaw, enlarged, and radula × 138_
- E Girasia crocea, Godwin-Austen.
 - Is! Left shell-lobe
 - Oviduct
 - Ovo-testis
- Retractor muscle of penis. rmp
 - rm rsl rdl Retractor muscle
 - Right shell-lobe
 - Right dorsal lobe pr Prostate]

by the former, with the exception of a narrow area on the posterior left margin. From the anterior right margin of this area a wellmarked cicatricial line runs forward to just above the respiratory and anal orifices, and marks the usual distinct division of the shelllobes in Helicarron and Dungella and their complete separation, as in Macrochlamys, into a left (frontal) and right (posterior). The dorsal lobes are divided diagonally forward from the respiratory orifice into a large left dorsal lobe and (behind and adjacent to the orifices) a smaller right dorsal lobe, on the extreme posterior side a slight beading marks the junction of these lobes with the shell-This portion of the animal is sunk into a deep, lobes above V-shaped, smooth, and unwrinkled depression in the back, where the dorsal ridge of the foot terminates suddenly. Extremity of the foot truncate, with a large linear mucous gland; the pedal (peripodial) line is very distinct

"Foot divided longitudinally into three subequal median and

lateral areas." (Godwin-Austen.)

Genitalia as in Austenia gigas Radula with tricuspid rhachidish tooth, the broader unner laterals usually bicuspid and the outer laterals with two cusps each, both terminal, thus differing from those in Macrochlamys, Austenia, and Helicarion.

Grasia hookeri, Gray, Cat Pulm Brit. Mus. p 61 (1855),
Godwin-Austen, P Z S 1880, p. 291, pl 27, id Mol Ind 1,
1888, p 219, pl 55, figs 1-1 b, 2-2b (animal and shell), pl 60,
figs 3, 4, 5 (animal in motion), pl 62, fig 1 (teeth), ii, 1899,
p 104, pl 88 (spermatophore)

Helicarion (Hoplites) theobaldi, Godwin-Austen, P Z S 1872,
p 517

Helicarion shillongense, Godwin-Austen, J A S B 1875, 2, p 4,
pl 2, fig 1

Helicarion brunneum, Godwin-Austen, J A S B 1875, 2, p 5,
pl 2, fig 2, Nevill (Parmarion), Hand-l i 1878, p '13

Girasia extranea, Cockerell, A M. N H (6) vii, 1891, p 104 nec
Limax extraneus, Féi

Girasia deplessa, subsp of G extranes, Cockerell, l. c

Shell oblong, membranaceous and soft, with a thin olivaceous epidermis, cuiled up so as to form an incipient spile at one end, drawn out into a broad ribbon-like stripe at the other. Length about 20 mm

Animal varying from pale yellowish dull grey or pale brown to ochraceous or dark umber-brown, sometimes spotted on mantle. The mantle-lobes completely cover the shell, at times leaving a small area exposed, they also cover a considerable portion of the animal in front of the shell. Length of animal 3 to 4 inches

Teeth in radula thus arranged 95 2 18.1.18 2.95 (115 1 115) Of the broad teeth in the middle of the row the rhachidian has three cusps, the admedian two, one on the outer margin, all the outer laterals are bicuspid, the two cusps being terminal

301 Girasia radha, Godwin-Austen, Helication (Hoplites), J A S B 1876, 2, p 314, pl 8, fig 4 (animal crawling), id Mol Ind 1, 1888, p 222, pl 60, figs 6, 6 a (animal).

Shell membranaceous, polished, a long strip with a projecting point at one end, not forming a distinct spire; colour greenish brown, margin of peristome convex, becoming concave on the side near the apex.

Major diam 16½ mm.

Hab Banks of Radha Pokri (tank), near Narrainpur, Darrang District, Assam (Godwin-Austen)

Animal rich ochre, sparsely dappled with grey-black on the mantle and tail. Length when extended 3 inches, mantle 13

Near G. hooker: Shell more rudimentary and colour different. The mantle quite conceals the shell and covers the animal as far the head.

[Girasia? rubra, Godwin-Austen, transferred to genus Crypto-girasia, p. 204]

302 Girasia crocea, Godwin-Austen, Helicarion (Hoplites), P Z S 1872, p 517, pl 30, figs 9, 9 a (animal crawling and shell), Nevill (Parmarion), Hand-l 1, 1878, p 13, Godwin-Austen, Mol Ind i, 1888, p 223, pl 60, fig 2 (animal), pl 62, fig 6 (radula)

Shell very thin, flat, rudimentary, horny translucent, with a broad band of dark green from the apex to the edge of the membranaceous peristome; apex pointed and projecting, without any distinct coil, peristome convex throughout, except where it approaches the apex, when it becomes concave.

Major diam. 18, min 8 mm

Hab Valleys below Cherra Punji, Khási Hills. Found creeping

on high grass near Teria Ghat (Godwin-Austen).

Animal a fine bright saffron-yellow colour, mantle mottled with pale yellow, outside edge of foot very pale yellow and almost white below; extremity of foot truncate, with a gland as in Austerna gigas Length of animal 2½ to 3 inches

Odontophore quite peculiar The middle tooth has three subequal cusps, all at the extremity, the next 9 on each side have a small outer cusp, the outer teeth are throughout evenly bicuspid, decreasing in size to the outermost laterals. They are thus arranged 100.9.1.9 100 (109.1.109) This is quite different from any Girasia, and the only similar arrangement is found in Durgella khasiaca

- 303. Girasia pankabariensis, Godwin-Austen, Mol Ind 1, 1888, p 225, pl 59, figs 1-1 c (animal)
- "Anımal with the right and left mantle-lobes united; the mantle appears to be slightly speckled. The shell is deeply sunk

in a depression, the ridge of the foot behind being on a level with the shell Generative organs immature."

Length of specimen in spirit about an inch.

Hab Pankabari, at foot of Himalayas, Sikhim.

Teeth in radula + 100 2.16.1.16 2 100+(+118.1.118). All gradually decreasing in size from centre to margin. Jaw straight, with a very slight central projection.

*304. Girasia dalhousiæ, Godwin-Austen, Mol Ind. 1, 1888, p 224, pl. 61, figs 1, 1 a (anunal), pl 62, figs 4. 4 a (jaw and testh)

"The shell is of an olive-brown colour, convex above, oval on the periphery, membranaceous, broader than in the type or in G. crocca, with a very thin white shelly lining.

"Major diam. 13, minor 8 mm"

Hab Dalhousie, Chamba Hills, west Himalayas (Theobald).

of any kind. The mantle as in typical Girana, the thin shell showing in an oval opening of the shell-lobes. Length in spirit 30 mm.

Radula thus arranged: 128.2.14 1.14.2.128 (144.1.144). Rhachidian tooth very narrow, long and tricuspid; inner laterals much curved and tricuspid, the inner cusp indistinct, points directed rather outwards; outer laterals bicuspid, the outer cusp larger and rounder in foim than the inner Jaws with a very slight central projection. The teeth differ from those of the more Eastern species.

*305. Girasia burtii, Godwin-Austen, Helicarion (Hoplites), J A S B 1876, p. 314, pl 8, fig 6 (shell), id P Z S 1880, p. 294, id Mol Ind i, 1888, p 222, pl 61, fig 2 (shell), pl 62, figs 3, 3 a, 3 b (teeth of radula, jaw, and generalia, these are by error marked G. radha).

Shell dull white, very horny in texture, the apex scarcely developed, outline rounded above. Major diam. 0.30" (8 mm). The shell is figured as oval in shape, with the apex turned over in the middle, not towards one side as in many forms of Guasia.

Hab Borelli Tea-garden, near Tezpur, Assam (Burt), also Paniputer Tea-garden, north of the Brahmaputra River in the same

Animal grey-brown in colour, measuring. mantle to head 0 4 inch, mantle 0 8, mantle to extremity of foot 0 5, or total length

when moving 1.5 inches.

Jaw curved, no central projection Rhachidian teeth parrow and long, tricuspid, inner laterals bicuspid, the cusps low down on outer side, outer laterals evenly bicuspid, both cusps terminal In each row 186.2 6.1.6.2.186 (194.1.194), being 6 or more than in G hookers

*306 Girasia? cinerea, Godivin-Austen, Helicarion (Hoplites), J A
S B 1876, p 314, pl 8, fig 2 (animal); id Mol Ind 1, 1888,
p 241, pl 60, fig 8 (animal)
[Vide fig 64 B, p 184]

Shell not described "Animal when fully extended long and narrow; colour dusky grey; mantle with a papillated surface slightly spotted, the spotting being coarser on the body and tail Tentacles (eye-pedicels) short and blunt, with the oral (tentacles) very close below them.

" Length 0 75, mantle 0 4 (18 $\frac{1}{2} \times 10\frac{1}{2}$ mm)"

Hab On the Darpaug River, at foot of the Dafla Hills, under

old logs in the forest (Godwin-Austen).

This species may be recognized by its bluish-grey colour and small size

307. Girasia affinis, Cockerell, A. M. N. H. (6) vii, 1891, p 106

The shell in an alcoholic specimen is almost completely covered by the mantle, except a small space 3½ mm across. Both foot and mantle spotted with dark grey, and the whole length, when contracted in alcohol, is 42 mm. The posterior portion of the foot is very high and sharply ridged. The shell is evidently soft and membranaceous.

Hab Pegu (Theobald).

308. Girasia? dikrangensis, Godwin-Austen (Testacella?), J A S B. 1876, 2, p 314, pl. 8, fig 7, Nevill (Parmacella?), Hand-l i, 1878, p 13

Shell ovate, slightly convex above, concave below, the apex inclined towards the left, but not involute nor forming a closed whorl; just below the apex there is an appearance as if one margin of the peristome were folded over the opposite one. The apex does not extend beyond the columellar margin of the peristome.

Major diam. 12, min $6\frac{1}{2}$, height 2 mm.

Anımal unknown.

Hab Pachitah, Dikrang River, Dafia Hills, Assam (Godwin-Austen)

Only two dead shells have been found

[The shell is very different from that of Ginasa, being far more solid. It is placed here provisionally until living examples are obtained.]

[Genus CRYPTOGIRASIA

Oryptogirasia, Cocketell, A. M. N. H. (6) vii, 1891, p. 99 (no description)

Type, Girasia? rubra, Godwin-Austen, only known from the

Anghami Naga Hills.

Animal the most slug-like of any of the Indian forms, the shell being completely covered by the mantle and the shell itself reduced to an oval disk, the posterior end of the mantle resting in a V-shaped depression. The extremity of the foot with a long soft overhanging lobe. Internal anatomy not known. It is represented by a single species, but no doubt others will be found on the eastern frontiers, Buimah, &c.]

309 Cryptogirasia rubra, Godwin-Austen (Parmarion), J. A. S. B. 1875, 2, p. 6, pl. 2, figs. 4-4 c (animal crawling and shell), id. Mol. Ind. 1, 1888, p. 228, pl. 61, figs. 4 a-4 d (animal and shell) [Vulc fig. 64 D, p. 184]

Shell quite rudimentary, a small oval shelly disk about 31 mm. long.

Hab. Kohima, Anghami Naga Hills (Godwin-Austen)

"Animal of a fine orange-pink, grey on underside of the foot, tentacles short; mantle entirely covering the shell, with only a slight trace of a longitudinal opening running back from the anterior left side; three parallel bands of greenish grey along the back of the neck, the eye-tentacles being of the same colour. The gland at extremity of foot with a long overhanging lobe."

Length of animal when moving 18 inches (45 mm.) The generic relations of this animal are doubtful.

Genus MARIÆLLA.

Mariella, Gray, Cat Pulm B M pt 1, 1855, p 62, Webb, Proc Mal Soc in, 1898, p 151, Godwin-Austen, Mol Ind 11, 1899, p 113

Tennentia, Humbert, Rev et Mag Zool 1862, p 427, pl 17 Vega, Westerhind, Vega-Elped 1v, 1887, p 188, pl 11 Dekhama, Godwin-Austen, Mol Ind 1, 1888, p 242, pls 52 & 62

Type, M dussumers, Gray

Range. Western Ghats, from Mahableshwar southwards, and hill-country of Ceylon

Shell internal, solid, ovate, convex above, flatly concave beneath, with a small apex, not coiled, lying on the right side as seen from

about near the end.

Animal very similar to that of Girana, but the lobes of the mantle united into an eval shield, tricarinate above and completely covering the shell, only a small pinhole-like orifice [near the posterior end] being left open. From this small enfice a distinct line or cicatrix runs to the respiratory aperture on the right side, [marking the dividing line of the right and left shell-lobes]. The mantle extends forward over the neck, but not behind the shield, which is sunk behind in a depression of the back. The body behind the shield is sharply keeled above and terminates in a large mucous pore. Peripodial groove distinct as usual, but nairow, and sole tripartite longitudinally

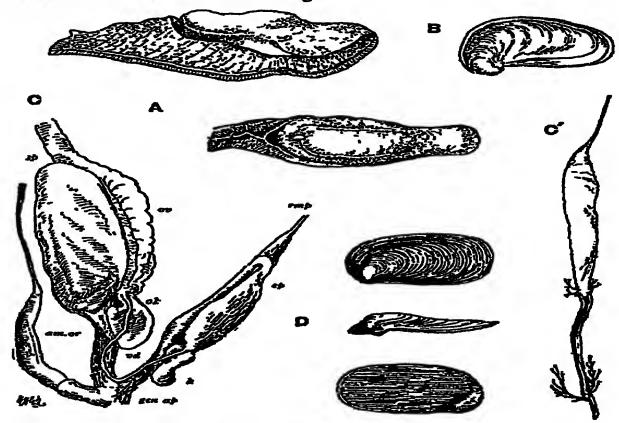
Genitalia and odontophore much resembling those of Guasia. The dart-sac is long and cylindrical. There is a large swelling of the free oviduct (ovitheca) just beyond the point where the vas deferens is given off. The spermatheca is rather irregularly ovate, and increases in size when containing numerous spermato-

phores, as in figure. The penis is provided with a small kalc-sac and gives off a short cocum, the retractor muscle is attached to the bend

The radula has a broad band of wider median teeth, tricuspid as a rule, and these pass unto bicuspid outer laterals, with the two

cusps subequal and terminal as in Girasia

From Girasia the present genus is separated by its almost imperforate shield, the more solid shell of different form, and by several small distinctions in the genitalia.



[Fig 71 —Mariælla dussumieri Dark olivaceous-green specimen

Animal, view of right side and from above. $\times 18$

Shell ×34

Black specimen

O Genitalia ×2.

Spermatophore. ×34.

D Shell. ×18]

310 Mariella dussumieri, Gray, Cat Pulm B M 1855, p 63
Fischer (Viquesnelia), Journ Conchyl 1856, p 290, pl 3, fig 18,
Webb, Proc Mal Soc 11, 1878, p 153, pl 9, figs 1-6 (animal,
shell, and anatomy), Cockerell, Nautilus, x11, 1898, p 9; GodwurAustin, Mol Ind 11, 1899, p 113, pl. 93, figs 1-1 c, 2-2 c (animal, shell, and anatomy).

Tennentia thwaites, Humbert, Rev. et Mag Zool 1862, p 42, pl. 17, ingr 1, Semper, Reise Philip, Wiss Res. 1870, p 7
Vega nordenskioldi, Westerlund, Vega-Exped. 1v, 1887, p 188, pl 2

Shell in general thin, slightly convex, ovate, white, the apex forming a small point at the right side and near the posterior end, not involute

Hab. The Western Ghats as far north as the Kadur district of Mysore and perhaps to Mahableshwar. Hill-tracts of Ceylon. The original locality was Mahe, a French town between Calicut and Cannanore on the Malabar coast, and not, as was supposed, Mahé in the Seychelles Islands

Animal yellowish brown or olivaceous, sometimes almost black,

and generally mottled with dark blotches

[The mantle has two narrow raised ridges on the shell-lobes, one running from the little shell-aperture round the left margin of the shell, the other towards the respiratory orifice on the right margin.]

The size appears to vary up to about 8 inches in length

Teeth of radula in one specimen 88 3.20.1.20.3.88(111.

1.111), in another 95.2.18.1.18 2 95 (115.1.115)

A species of this genus was found by me at Mahableshwar It was less than 2 inches in length and the shell is only 7 mm. long It may have been a young specimen of M dussumiers or a smaller species

311. Mariælia beddomei, Godwn-Austen, Girasia (Dekhania), Mol Ind 1, 1888, p 248, pl 58, figs 1-1 b (animal), 2-2 b (shell), pl 62, figs 7-7 a (jaw and radula), var. mgra, pl 58, fig 5, var maculosa, pl 58, fig 4, var fig 6, Webb, Proc Mal Soc m, 1898, p 154, pl. 9, fig 7

Shell thinner than in *M* dussumiers, shelly, flat and smooth beneath, white, with close, concentric lines of growth.

Length of a specimen 12, breadth $6\frac{1}{2}$ mm.

Hab. Travancore Hills.

Animal varying greatly in colour from uniform other to deep grey-black or spotted; [no raised ridges on the shell-lobes]; externally similar to *M. dussumieri*, but larger, about 4 inches in length when fully extended, and having more numerous teeth in the radula, the number in a row being 122.5 21.1.21.5 122 (148 1.148), and the shape differing somewhat. There are also differences in the genitalia, the spermatheca and the expansion in the free oviduct (outheca) having different forms

Genus PSEUDAUSTENIA.

Pseudaustenia, Cockerell, P Z S 1891, p 225 (no description), A M N H (6) vii, 1891, p 99

Type, P. atra, Godwin-Austen.

Range. Hills of Southern India, Nilgiris, and Travancore Shell oblong or ovate, ear-shaped, flat above; apex slightly involute; none of the whorls enclosed beneath, the whole shell lying open to the apex, and a slightly raised division alone sepa-

rating the apical whorl

Animal with shell-lobes turned over the shell and coalescing round it, not covering it when preserved in spirit. Right shell-lobe extending back towards apex, then terminating in a rounded end. Left shell-lobe continuous with right anteriorly, but separate behind. The left dorsal or neck-lobe covers a considerable part of the neck and extends along the left side to behind the shell. Back of foot behind the mantle flattened, not keeled, divided anteriorly into two well-developed lappets, forming between them a deep V-shaped depression, in which the shell and mantle are sunk. The posterior end of the foot terminates in a small linear mucous pore, overhung by a small lobe, the peripodial groove well marked, sole of foot tripartite longitudinally.

After removing the shell the uppermost of the visceral sac whorls are seen to be more developed in the animal than is usual in slug-like forms, the small hooked process of the liver-lobes [filling the apex of the shell] being much better developed than in Girasia. In the genitalia there is no dart-sac, the spermatheca is a globular sac on a tube; the male organ is simple, bent on itself at the retractor muscle, on the proximal side of which it is considerably expanded to form the spermatophore (fig 72) just beyond the junction of the vas deferens, but there is no kalc-sac or flagellum, nor is there any excum leading to the retractor

muscle.

[Radula 24.1 19.1 19.1.24 (44.1.44)]. The broader teeth in the middle elongate and tricuspid, the outer teeth small

and bicuspid, only one cusp terminal.

This is distinguished from the African genus Africation by its very different shell, its back lappets, and by the form of the male organ, which in Africation [is much more simple, the vas deferent joining the shaft of the penis at the retractor muscle, there being no epiphallus. It differs materially from Austenia and Girasia in the shell, the absence of the amaterial organ, and the general form of the male organ, which has a penis papilla Neither has it any relationship to Ibycus nor Parmacochlea as put forward by Mr T. D. A. Cockerell (P. Z S. 1891), the first genus being shown by its radula to belong to the Durgellinae. The internal anatomy of Parmacochlea is in many points most unlike that of Pseudaustenia atra.

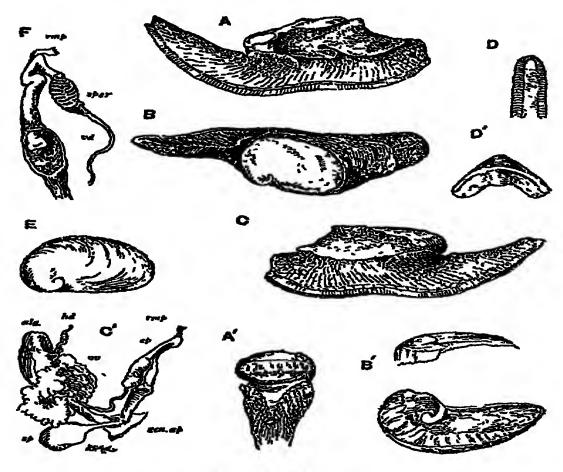
312 Pseudaustenia atra, Godwin-Austen (Africarion), Mol Ind 1, 1888, p 244, pl 57, figs 1-6 (animal, anatomy, and shells); vars aterrina, cinerea, and castanes, l c. p 245

Shell ovate, slightly convex above, concave below, smooth, covered with a straw-coloured or green membranaceous epidermis, which overlaps the peristome to a considerable extent; whorls 1½, the apex, as in Austeria, is flat All the lower surface of the shell

is open, and only a slight projecting ridge of shell separates the whole of the apex

Length 12, breadth 7, about 2 mm high

Hab Travancore and Tinnevelly Hills (Beddome)



[Fig 72 -Pscudaustenia atra.

- A View of right side × 18 Shell removed.

 B View of dorsal side × 18
 C View of left side × 18
- D Portion of sole of foot ×18
- E Shell of ×18
- F Male organ, showing spermatophore (sper.) in process of formation

Pseudaustenia aterrima

- A' Animal, seen from behind, shell not removed, showing the membranaceous peristome and the dorsal lappets × 18
- B' Shell. × 3 Right side and interior views
- C' Genitalia D'. Jaw × 9 $\times 18$
- ×9]

Animal varying from chestnut or pale grey to black, more or less mottled and banded Length, when living, about 50 mm.

(2 inches), the hinder part of the foot long and narrow, with a small mucous pore overhung by a small lobe. The foot is distinctly divided into three longitudinally. Radula 24 1.19 1.19 1 24 (44 1.44)

313. Pseudaustenia auriformis, Blf (Vitrina) J A S B 1866, 2, p 36, Pfi (Vitrina) Mon Hel v, 1868, p 15, Nevill (Helicanon), Hand-l 1, 1878, p 16, Godiom-Austen (Africanon), Mol Ind 1, 1888, p 245, pl 57, fig 7 (shell).

Shell very depressed, oblong-ovate, very thin, smooth, convex without, with a greenish membranaceous epidermis, which projects beyond the peristome, nucleus paler, spire flat, about 1½

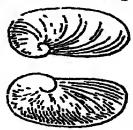


Fig 73 -Pseudaustema auriformis

whorls Aperture occupying the whole lower surface of the shell and exposing the interior to the apex

Length 13, breadth 8, height 21 mm.

Hab. Sispara Ghat, Nilgiri Hills

Animal not known The shell differs from that of P atra by being more oblong and less elliptical, and by the smaller apex, the outline of which projects beyond the margin of the peristome

Genus CRYPTOSOMA

Cryptosoma, Theobald, J A S B xxv1, 1857, p 252, Godwin-Austen, Mol Ind 1, 1888, p 14, pl 4 (animal, shell, and details of anatomy), ii, 1898, p 50 (anatomy)

Type, C præstans, Gould.

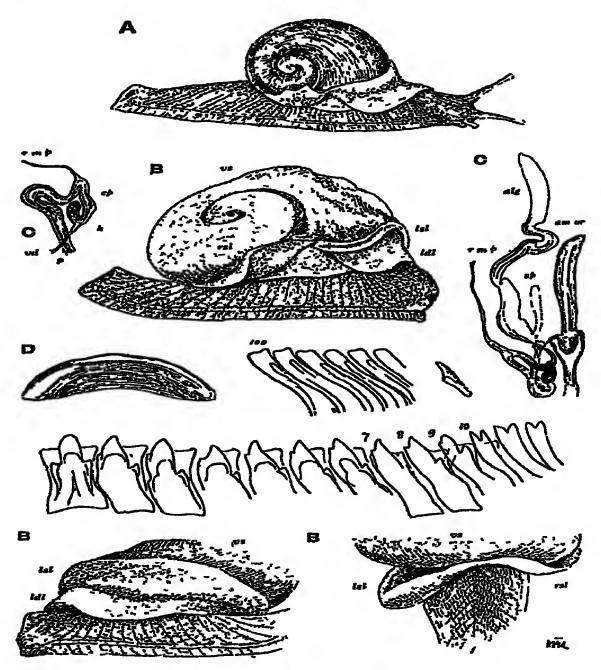
Range Burma, Siam, and Southern China to Hong-Kong

Shell imperforate and with few whorls, like that of Vitrina, and only differing from Helican ion in being thicker, in the last whorl descending, and especially in having a stronger peristome,

which, in the dry season, is furnished with an epiphragm.

Animal retractile within the shell. The lobes of the mantle are small as compared with those of Comptausterna, and cover a small part of the shell, right and left shell-lobes united at the back of the shell. A large gland at the posterior termination of the foot without any overhanging lobe. Peripodial groove well developed; sole of foot in three longitudinal divisions. Generative organs much as in Austeria; amatorial organ very large, spermatheca cylindrical. Odontophore with much more numerous lateral teeth than in Indian

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[Fig 74 -Cryptosoma præstans, Gould

A Animal, drawn from life Nat size

B, B, B Animal, from a spirit-specimen Enlarged Seen from the right and left sides, also part of dorsal side, showing junction of the right and left shell-lobes behind the visceral sac (vs)

O. O Generative organs.

D Jaw and teeth of the radula, from centre to the 12th, the 100th tooth and 5 adjacent, and one of the outermost]

forms of Helicarionina; rhachidian tooth broad, with a small basal cusp on each side, inner laterals usually bicuspid, with the cusps on the outer side far from the apex, outer laterals with two subequal terminal cusps. This is scarcely worth generic rank, but the typical forms are easily recognized. The outer, teeth in the radula differ considerably from those of Cryptaustenia and Austenia, and approach in character those of Girasia.

314. Cryptosoma præstans, Gould (Vitrina), Bost Jour N H 1v, 1843, p 456, pl 24, fig 2, Pfi (Vitrina) Mon Hel 11, 1848, p 497, Theob J A S B xxvi, 1857, p 252, H & T (Vitrina) C. I. 1876, pl 65, figs 5, 6, Nevill, Helicarion (Ciyptosoma), J A S B xlvi, 1877, 2, p 25, id Hand-l 1, 1878, p 14, Godwin-Austen, Mol Ind 1, 1882, p 14, pl. 4
Austenia Pkhyoungensis, Godwin-Austen, P Z S 1888, p. 241

Shell depressedly globose, rather solid, translucent, covered with an epidermis, having when fresh a resinous lustre, transversely striated, without spiral sculpture, pale greenish horny to brownish; spire very low, convex, apex not exserted, suture almost flat; whorls 3½, slightly convex above, the last much larger, descending considerably towards the peristome, rounded at the periphery, rather swollen beneath, aperture very oblique, slightly contracted, almost semioval, breadth exceeding height, peristome not very thin, upper margin slightly arcuate, columellar curved throughout, receding, and meeting the penultimate whorl almost in a line, at a very open obtuse angle.

Major diam. 22, min. 17, height 12 mm.

Hab. Mergui, Moulmein, Martaban, Tenasserim Valley, Shan States (Woodthorpe); Sawady and second defile of the Irrawady,

Upper Burma (Anderson); Upper Stam (Daly).

The rows in the radula are about 100 in number, each consisting of about 260 teeth, thus arranged: 120.2.7.1 7.2 120 (129.1.129) In the outermost laterals the cusps at the end disappear, and the teeth have blunt almost square terminations, [their form in this case perhaps due to being worn down].

The form from the Shan Hills, to which the name khyoungensis was applied, is a little more depressed than the Moulmein shell, measuring $20 \times 15\frac{1}{2} \times 10$ mm, but there does not appear to be any other difference. Other specimens from the Shan States are

larger and measure $31 \times 24 \times 15$ mm

The original type was described as spirally striate. No spiral striation can be found in shells from Moulmein or further north, but there are some subobsolete traces of spiral lines in Siam shells.

315. Cryptosoma inusitatum Godwin-Austen, Mol Ind. 11, 1898, p 51, pl 70, figs 1-8

Shell depressedly globose, thun, polished, smooth, with indistinct lines of growth, brown in colour, spire low, convex, apex not

P 2

projecting, suture almost flat, whorls 3, rapidly increasing, flatly convex, the last descending in front, rounded at the pemphery. aperture lunately ovate, very oblique; peristome thin, margins converging

Major diam 25, min 191, height 14 mm. Other specimens

measure 29½ mm in major diameter

Hab Eastern Burma, about 300 miles NE of Moulmenn

(Woodthorpe)

The animal is much like that of C. piæstans, the left shell-lobe covered with large oval tubercles intermixed with smaller, some pale-coloured, some black. The dart-sac is very large and attached by strong muscles almost throughout its length The radula contains 132 rows of teeth, thus arranged 140.3.17.1.17 3 140 (160.1 160), and the teeth me differently formed from those of C præstans, the admedians more numerous, and the outer terminally bicuspid throughout

316. Cryptosoma 2 birmanicum, Phil Zeitsch. J. Mal 1847, p 65, Pfr Mon Hel 11, 1848, p 498, H & T C I 1876, p. 61, pl 152, fig 7, Nevil (Helicarion), Hand-l 1, 1878, p 14

Shell depressedly globose, thin, pellucid, very smooth and polished, pale houny; spire low, suture slightly impressed, whorls 31, convex, the last rounded at the periphery, descending in front, aperture oblique, roundly lunate, broader than high, peristome thin.

Major diam 11, mm 8, height 5½ mm

Hab Near Mergui (Philippi).

There are two specimens of shells with this name in the British Though they differ a little from Philippi's and Pfeiffer's descriptions they agree, on the whole, fairly.

317 Cryptosoma austeni, Collinge, Jour Mal vii, 1898, p 2, pl 1, figs 1-5

"Shell apex depressed, thin, strice definite, brownish or horn colour." Whorls 3½

Animal light yellowish brown, darker on the head and posterior dorsum, which latter is shortly keeled Right shell-lobe welldeveloped, left lobe very large . Caudal mucous pore large, with . Foot-sole divided. Length of animal no overhanging groove (in alcohol) 22 5 mm.

Hab? Sent from Calcutta, but probably derived from some other

place In a brief account of the anatomy it is pointed out that the generative organs differ in several points from those of C prastans The shell is very unlike that of Cryptosoma, more like that of Crypiaustenia bensoni]

[Subfamily DURGELLINÆ.

Durgellines, Godwin-Austen, Mol. Ind 1, 1888, p 253 (typical genus Durgella), n 1898, p 60

Shell globose or much depressed, thin, often membranaceous Animal with ample shell-lobes on both sides, nearly concealing the shell in life. The amatorial organ is present in some genera, absent in others. The radula is very broad, with a great number of similar, closely-packed, curved teeth on narrow plates, in some species as many as 400-500, either plain or with a pectinate side Jaw generally thin and weak, stouter in some.]

Genus DURGELLA

Durgella, Blf. A. M N H (3) 11, 1863, p 81, Godwin-Austen, Jour Lann Soc, Zool av, 1881, p 291 (anatomy), id. Mol. Ind 1, 1883, p 142, 11 1898, p 60, 11, 1907, p 205

Type, D levicula, Bs

Range Probably the greater part of the Indo-Malay Region. Shell thin, Vitrina-like, of four whorls, with a large oblique mouth.

Lobes of the mantle partially covering the shell when expanded, the right shell-lobe being broad and triangular, the left also triangular and reflected over the edge of the shell from near the respiratory orifice. Dorsal lobes moderate. A broad peripodial fringe; the mucous pore is well developed, with a large overhanging lobe; sole divided into 3 parts longitudinally. In the generative organs a dart-sac is large and usually present, sometimes absent; the spermatheca is of moderate size, wide at the base, then constricted, and broader again at the end, there is no distinct kalc-sac, though an expansion may be noticed at the junction of the vas deferens.

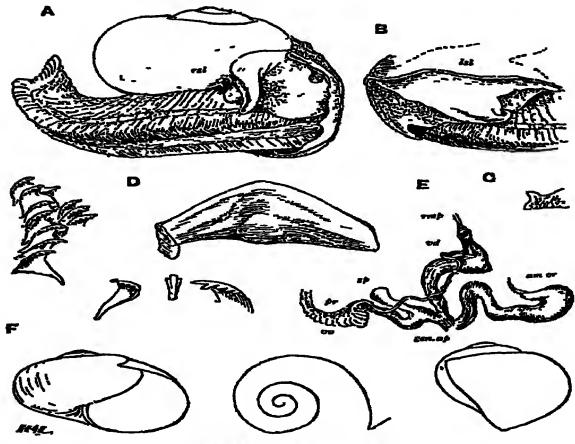
The jaw is thin, membranaceous, almost straight on the cuttingedge. The odontophore is broader than long, with a minute rhachidian tooth, generally unicuspid; the lateral teeth are excessively numerous, there being no broad plates near the middle, but a gradual diminution takes place in size from the innermost to the outermost tooth, all having a serrated curved edge with numerous cusps.

- a Typical forms from Eastern Himalaya, Assam, and Burma
- 318 Durgella levicula, Bs. (Helix) A M N H (3) 11, 1859, p 391, Blf A M N H (3) x1, 1863, p 81, id (Nanna) J A S B 1865, 2, p 87, Pfi (Helix) Mon Hel v, 1868, p 48, H & T (Helix) C I 1876, pl 90, figs 1, 4, Godum-Austen, Joun Linn Soc, Zool xv, 1881, p 291 (anatomy) Nevill (Nanna), Handli, 1878, p 26, Godwin-Austen, Mol Ind 1, 1883, p 142, id t c 11, 1898, p 61, pl 76, figs 1-6 (anatomy)

Shell subperforate or very narrowly perforate globosely de-

pressed, thin, almost smooth, more or less polished, translucent, whitish horny, in some cases faintly striated with subobsolete spiral lines; spire convex, apex obtuse, suture impressed; whorls 32, rapidly increasing, the last rounded at periphery, moderately tumid beneath; aperture oblique, large, roundly lunate; peristome thin, slightly arcuate above, columellar margin subvertical, slightly reflected

Major diam 8½, min 7, height 5 mm.



[Fig 75 — Durgella leveula

- A Animal, view of right side From a spirit-specimen B Ditto, left side Ditto, much enlarged
- C Extremity of foot and lobe above mucous gland, as in life D Jaw, × 3, and teeth of indula, the centre and admedian.
- E The generative organs $\times 6$ F Shell, with sutural spiral $\times 3$.]

Hab. Tenasserim, Phie Than, Methan at base of Mule-it This or closely allied forms are found in Pegu, Range, &c also Balasore Hills, Orissa (W T. B), Golconda in Northeastern Madras (Beddome)

Animal pale ochre, with a dusky line on the upper part of the

extremity of the foot, also on the neck, tentacles moderately

long

Mantle-lobes moderately developed Spermatheca thick, short, and wide at the base, with a swollen wide terminal portion Dart-sac large, cylindrical, but twisted in form. The vas deferens joins the male organ close to the retractor muscle; without kale-sac.

The teeth in the radula exceed 170 1.170 the rhachidian tooth is very minute, the laterals very numerous and closely set together, their upper edge serrated with 5 or 6 points each, and they diminish gradually in size outwards. There are upwards of a hundred rows of teeth in the odontophore. The jaw is very thin and membranaceous, nearly straight in front.

[319 Durgella rogersi, Godwin-Austen, Mol Ind 11, 1907, p 205, pl 115, figs 4, 4 a, pl. 116, figs 7, 7 a

Shell globose, very thin, membianaceous it was impossible to remove the animal preserved in spirit without tearing it. Whorls 3½; colour pale straw, apex flatly rounded.

Hab. Paphunta Valley, South Andamans (G Rogers)

Animal about 20 mm., contracted in spirit. Foot long behind, pointed, keeled, narrow, sole divided, peripodial grooves with parallel streaking running from them to the margin of the foot. A fairly large lounded right shell-lobe rising on the side of the right dorsal lobe, the left shell-lobe smaller than the right, rounded on the margin, both shell-lobes somewhat thickened, pale-coloured, unmarked, and smooth

The genitalia were not, unfortunately, got out in a state for description. The penis is simple, like that of D levicula; no amatorial organ seen.

Jaw very thin, almost straight in front, only a slight convexity

in the middle.

Radula consists of an enormous number of teeth, there are at least 500 in the row, and 70 rows can be counted. It was got out in a nearly perfect state, but the filmy edges got folded under it; and it is most difficult when this occurs to spread them out again, rendering counting impossible. The teeth are more numerous in this radula and more minute than in any I have seen hitherto; they are in form of similar type to those of Dingella levicula and mairangensis, of Tenasserim and the Khasi Hills respectively, but still closer to the outermost teeth of Dingella? sumbaensis, G.-A. (vide Mol Ind vol 11, pl 79, fig 8 b), which may possibly belong to Lamprocystis, and points to this last genus having a position rather with the subfamily Dingellinæ than any other]

320 Durgella concinna, sp n
Nanna levicula, Blf J A S B 1865, 2, p 87, pt , Newll, Hand-l.

1, 1878, p 26, pt nec Bs

Shell subperforate, depressedly globose, fairly solid, smooth, with

a resinous lustre, translucent, pale, almost whitish horny; spire low, convex, apex obtuse, suture shallow, whorls 3½, rapidly increasing, slightly convex above, the last ascending near the mouth, rounded at periphery, rather tuinid beneath, aperture oblique, roundly lunate, peristome thin, margins converging, columellar curved, vertical above, slightly reflected.

Major diam. 7, min 6, height 4 mm.

Hab. Thayet Myo, Prome, and Akauktoung in Upper Pegu This is distinguished from D levicula by being much more solid, by lower spire, and much smaller mouth, the diameter of which measures 3½ mm. in a specimen 7 mm. in major diameter, whilst in a D. levicula of similar size it is over 4.

321. Durgella erratica, Godwin-Austen (Austenia), P Z. S. 1888, p 211
Nanina levicula, Bif J A S. B 1865, 2, p 87, pt, Nevill, Handli, 1878, p. 26, pt. nec Bs

Shell openly perforate, globosely depressed, thin, translucent, smooth, slightly polished, pale amber or brownish, spire hearly flat, slightly convex, suture shallow; whorls 3½-4, rapidly increasing, flatly convex above, the last much larger, scarcely descending in front, rounded at the periphery, convex beneath, aperture oblique, diagonal, ovately lunate; peristome thin, upper margin slightly depressed, columellar oblique, reflected

Major diam. 8, mm 7, height 4 mm

Hab. Pingoung, Shan Hills, Burma (Spratt), Bassem District, Pegu (W. T. B). Distinguished from D levicula by more open perforation, a rather thicker shell, and a smaller mouth

*322. Durgella assamica, Godum-Austen, Jour Linn Soc, Zool. Nr.
1881, p 294, pl 20, figs 5, 6, 8, pl 21, figs 2, 4, 4 a, 6, id Mol
Ind n, 1898, p 68, pl 77, figs. 1-6 (shell and anatomy)
[Vide fig 76, B-B 4, p 220]

Shell imperforate, subglobosely depressed, thin, membranaceous, smooth, olive-brown; spire low, suture impressed, whorls 4, rapidly increasing, aperture ovately lunate, oblique, peristome thin

Major diam 95, min 82, height (from figure) 5 min Hab. Paniputer tea-garden near Tezpur, Assam (Lumsden)

No dart-sac found in the two specimens examined Spermatheca longer than in D levicula A large overhanging lobe to the mucous pore. Peripodial lines strongly marked and triple Odontophore as in D. levicula

*323. Durgella mairangensis, Goduin-Austen, Mol Ind 11, 1898 p 64, pl 77, figs 7-11 (shell, details of anatomy, and radula)
Helicarion salius, Godwin-Austen, J A S B 1876, 2, p 313.

nec Bs

Shell globosely depressed, thin, smooth, shining, pale straw-colour, spire very low, almost flat, suture shallow, whorls 3, the last rounded, turned beneath, aperture oblique, descending, ovately

lunate, columellar margin oblique until close to last whorl, where it becomes vertical, slightly thickened, and reflected

Major diam. 7.5, min 5, height (from figure) 3.75 mm Hab Mairang, North Khasi Hills (Godwin-Austen)

Animal pale yellowish, rather more orange on foot, a dusky line on upper surface of extremity of foot. Length about 0 6 inch Dart-sac present; spermatheca rather short Rows of the odontophore with 320.1 320 teeth, which are larger than in D levicula.

This is very near D. salius, and has the same habit of jumping when touched

324. Durgella salius, Bs. (Vitrina) A M N H (3) 111, 1859, p 189, Pfi (Vitrina) Mon Hel 1v, 1859, p 799, H & T (Vitrina) C I 1876, pl 65, figs. 8, 9, Nevill (Helicarion), Hand-l 1, 1878, p 14, Godwn-Austen (Austenia), Mol Ind. 1, 1883, p 152, pl 37, fig 1, id t c 11, 1898, p 65

Shell imperforate, subglobosely depressed, not very thin, smooth, more or less polished, sometimes indistinctly closely striated, translucent, pale yellowish ochraceous, spire scarcely convex, apex not prominent, suture very slightly impressed; whorls 3½, rather flattened above, the last sometimes descending a little in front, rounded at periphery and beneath; aperture oblique, lunately subovate, peristome not very thin, margins converging, upper very slightly arcuate, columellar sinuate, rounded, subvertical above.

Major diam. $9\frac{1}{2}$, min 7, height $4\frac{1}{2}$ mm.

Hab. Khasi Hills, Teria Ghat, Lower Himalayas of Sikhim, common at Pankabari

Animal not examined In one shell there is part of an epiphragm remaining Col. Godwin-Austen has suggested (Mol. Ind ii, p 65) that this species belongs to Dingella. The name is derived from the jumping habits of the animal

*325. Durgella * seposita, Bs (Helix) A M N H (3) 111, 1859, p 267;

Pfr (Helix) Mon Hel v, 1868, p 51

"Shell imperforate, conoidly subglobose, thin, obsoletely obliquely striated, white, covered with a horny epidermis, spire low, conoidal, apex obtuse, suture slightly impressed, whorls 3, scarcely convex above, the last large, ventricose, forming almost the whole shell, area around the umbilicus slightly hollowed; aperture large, oblique, roundly lunate; peristome thin, straight, columellar margin descending with a curve, scarcely expanded

"Major diam. 7, min $5\frac{1}{2}$, axis 5 mm, length of aperture $4\frac{1}{2}$,

breadth 4" (Benson, in Latin)

Hab. Near Darpling

Although Sikhim has been very thoroughly searched since this species was named, no other specimens have been found, and

there must remain some doubt as to whether there may not have been an error in the locality, or whether the solitary specimen procured was not the young of some better-known shell. Two specimens from Theobald's Collection, now in the British Museum do not agree satisfactorily with the original description.

b Aberrant form

*326. Durgella khasiaca, Godwu-Austen, Mol. Ird i. 1883. p 145, pl 39, figs 7, 7 a, 7 b, 8, 8 a, 8 b (shell, Jaw, and radula)

"Shell depressedly orate, thin, horny, shiny, smooth with close, fine, transverse lines of growth; colour pale othraceous olive, spire very depressed, flatly convex. suture shallow; whorls 3, rapidly increasing; aperture oblique, flatly orate columellar margin but weakly developed '(Godwin-Austen)

Major diam 6.7, min 5, height (from figure) 3 mm

Hab. West Khasi Hills.

The radula is very remarkable, it contains 250.1.250 teeth in 120 rows the rhachidinn is elongate, with three terminal equal-sized points; the lateral teeth are all alike, much curved and terminally bicuspid, the outer point slightly in advance of the inner. All decrease gradually in size outwards. Jaw thin and horny, nearly straight in front.

There is some slight resemblance to the radula of this species in

Guasia crocca, but both shell and animal are very different

Genus IBYCUS

Ibycus, Heynemann, Mal Blätt x, 1862, p 142 Leptodontarion, suby of Helicarion, described by Paul & Friz Sarasin, Land-Mollieken von Celebes, p 124 (1899)

Type, I. fissidens, Heynemann

Range. Sikhim.

The original type of this genus was a spirit-specimen in very bad condition, all the posterior half of the body, half the mantle, and part of the shell having been lost. The radula shows remarkable characters. There is no median row of broader plates as in so many Lamacidæ, the rhachidian tooth is much broader at the base than at the point, the shovel-like point rising up like a spoon. The side teeth have two cusps, each projecting forward and connected with a plate behind, and pass gradually into rather smaller but similar teeth, each side of a row running backward from the middle tooth, "so as to resemble a flight of cranes." The jaw has a projecting median process, as generally seen in Macrochlamys, thus differing from other species of the Durgelling.

With this remarkable form Col Godwin-Austen's Durgilla minuta may perhaps be connected, as it has a somewhat similar radula

[The shell of the type species is very different from that of minuta.

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being conoid, of 3½ to 4 whoils, and the Sarasins do not describe the internal anatomy, which may prove very different from *Ibycus*. I give figures of the radula of both *Leptodontarion albacuminatus* and *L coriaceus* (fig. 76, D, E, p 220). *Leptodontarion* should be included in the subfamily *Dui gellinæ*]

327. Ibycus fissidens, *Heynemann*, *Mal Blutt* x, 1862, p. 142, pl 1, fig 3 (radulu)
[Tide fig 76, C, p 220]

Shell unperfect, convex, horny-leathery, brittle, translucent, amber-coloured, highly polished, with neat lines of growth. It is shovel-shaped, with the apical portion wanting, and may be part of a shell like that of Gu asia

The breathing-orifice appears to he far forward. A mantle covers the anterior half of the body and, as in *Limax*, is united with the sole Surface of the mantle distinctly tubercular Jaw with a prominent centile.

Radula as described under the genus. No size mentioned The shell, if figured of natural size, may have been half an inch long, and the whole animal possibly 2 inches, but this is uncertain.

Hab. Sikhim, at a height of 5600 feet (Schlagintweit) It should be remembered that some of the Schlagintweit collections, from Sikhim especially, were wrongly labelled.

328. Ibycus minutus, Godwin-Austen (Helicarion), J A S B 1876, 2, p 313, pl 8, fig 1, id (Durgella) Mol Ind 1, 1883, p. 144, pl 39, figs 1-G (shell, numal, radula, &c) [Vide fig 76, A-A 5, p 220]

Shell imperforate, depressed, ovate, translucent, smooth, polished lower portion membranaceous, brownish with an olive tinge; spire nearly flat, suture impressed; whorls 2½, rapidly increasing, the last rounded at periphery, slightly flattened beneath, aperture very oblique, diagonal, lunate, roundly ovate, peristome thin, margins converging, columellar above slightly inclined to the right.

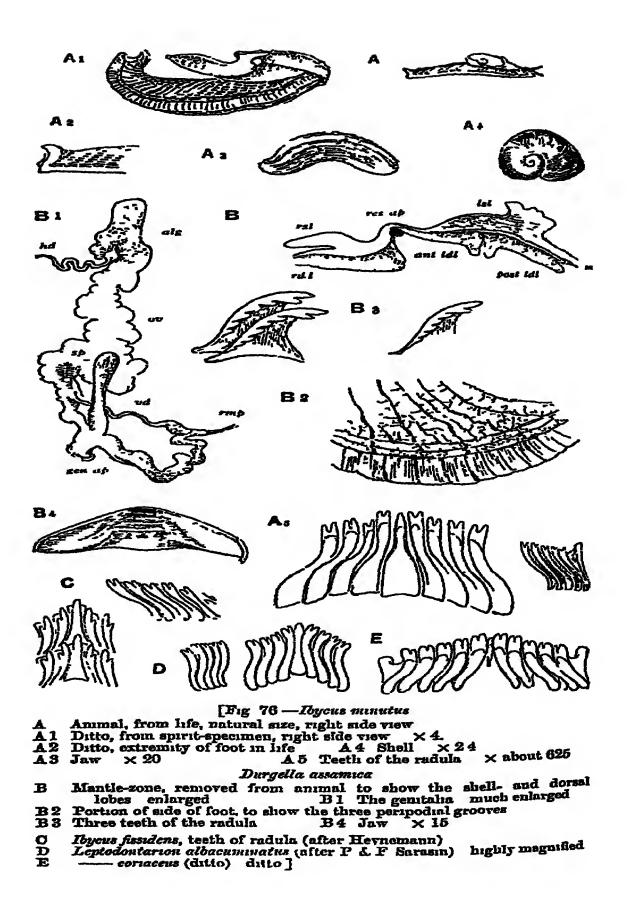
Major diam. 7, min 5, height 3 mm

Hab Under Toruputu Peak, Dafia Hills, also Jaintia Hills and

Non Dehing, Assam (Godwin-Austen)

Animal, when alive, pale horny, tentacles and line from them to the mantle dark-coloured, also a dark line down the upper surface of the foot behind the mantle. Lobes of mantle just covering the edge of the shell. The anterior portion of the body is much shorter than the posterior portion. Total length about 0.7 inch. A well-marked hooked process above the mucous gland. The middle portion of the sole of the foot is black throughout.

Radula with a straight unicuspid rhachidian tooth, increasing in width near the base, and numerous curved lateral bicuspid teeth, similar in form to each other and gradually decreasing in size as they are inclined backwards on each side of the central tooth. There is thus a very considerable likeness to the arrangement in



Tycus [There was sufficient to show in the generative organs the presence of the amatorial organ and simple form of male organ]

Animal not differing much from Durgella Col Godwin-Austen has called attention to the similarity of the radula in the Assam and Celebes shells of the genera Ibycus and Leptodontarion

Teeth in the radula 190.1 190 in each row. Jaw slightly

arched, without a median projection.

Genus SATIELLA *

[Fig. 77, p. 222]

Type, S delhanensis, Godwin-Austen

Range Southern India

Shell very thin and membranaceous, Vitrina-like, depressedly

globose or depressed, with few whorls and a large mouth

Mantle with well-developed shell-lobes extending over the shell Behind the shell the foot is generally carinate and ends posteriorly in a long lobe, on the under side of which is the mucous pore. The sole has a median and two lateral tracts, clearly divided. There is no dart-sac or amatorial organ; the sperinatheca is club-shaped, a pear-shaped or cylindrical body with a narrow neck opening into the oviduct. The was deferens expands gradually into a wider portion (epiphallus?) leading to the short cæcum, to which the retractor muscle is attached.

Teeth very numerous, in S levidensis (fig 77, F) 350 to 400 on each side of the rhachidians, the median and admedian teeth appear to be bicuspid, whilst some of the outer teeth have a multicuspid outer edge like that of a saw

Both the shell and radula differ considerably from those of

Durgella

329. Satiella dekhanensis, Godwin-Austen (Durgella), Mol Ind 11, 1898, p 68, pl 78, figs 1-2d (shell and animal), var bicolor, figs 3-5 (shell, animal, and generative organs)
[Fig 77, A, B]

Shell very thin, quite membranaceous and soft, depressed, translucent, smooth, polished, rich sienna-brown in colour; spire low, apex flat, suture linear, whoils 3½, the last large, sometimes angulate at periphery (perhaps through pressure); aperture lunately ovate, peristome very thin.

Major diam 18.5, min 15, height about 8 mm.

Hab Travancore, in Southern India

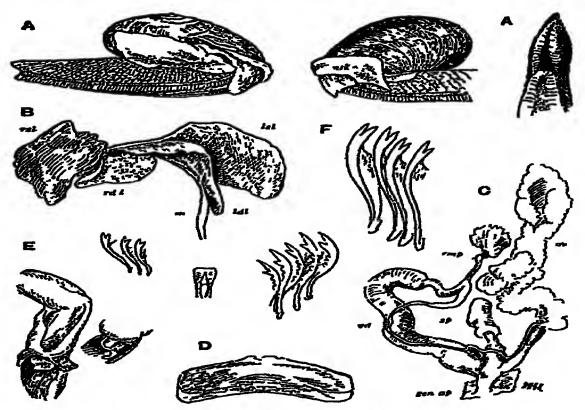
The shell is so soft that it is difficult to say whether the periphery is subangulate or not

Animal (fig. 77, A) with a narrow foot, sharply keeled behind, and

^{*} From "Satı ' or "Durga," also known as "Parvatı"

a pointed lobe overlying the narrow linear mucous gland. Shell-lobes (B) ample and probably in life cover the whole shell, they are smooth and paler than the remainder of the animal, they are not continuous round the back of the shell as in Austeria. Animal grey or pale ruddy other Jaw (D) soft and horny, straight in front Teeth very numerous; central tooth minute, pointed, lateral teeth serrated; minute as in S levidensis.

In the genitalia (C) no dart-sac, a penis papilla (E). The spermatheca is a moderately long blunt sac, attached by a short stem. The retractor muscle of the penis is very strong, given off where the vas deferens joins, no trace of a kalc-sac or flagellum.



[Fig 77 — Saticlla delhancisis

- A Animal, view of the right and left sides, life-size, and extremity of foot
- from beneath, × 6 From spirit-specimen

 B Mantle-zone defached from the animal, showing shell- and dorsal lobes

Satiella dekhanensis, var bicolor

- O Generative organs × 3
- D Jaw. × 18

Batrella levidensis,

E Male organ opened out on side × 3 F Central tooth and admedians, × 276, and four admedian teeth still more enlarged]

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330. Satiella christianæ, Theobald (Vitimia), J A & B xxxiii, 1864, p 245, H & T (Vitrina) C I 1876, pl 66, figs 7, 10. Nevill (Helicarion), Hand-l 1, 1878, p 14 Godwin-Austen, A M N H (5) vii, 1881, p 377, id (Durgella) Mol Ind 11, 1898, p 65, pl 79, figs 1-5 (shell, anımal, and anatomıcal details)

Shell imperforate, globosely depressed, thin, translucent, smooth, polished, pale yellowish horny; spire almost flat, suture impressed, whorls 31, convex, rapidly increasing, the last rounded at periphery, swollen below, aperture oblique, roundly lunate: peristome thin, slightly arcuate above, columellar margin subvertical.

Major diam. 13, min. 11, height 8 min A smaller specimen is

 $10 \times 5 \times 6$ mm.

Hab. Andaman Islands, Port Blair.

Animal in spirit-specimen about 1½ inches long Whole body dark, with the shell-lobes conspicuously pale-coloured lobes of mantle large. No dart-sac; the spermatheca long and

small, expanding at the end into a large pear-shaped sac.

In each row of the radula there is a very minute rhachidian tooth, terminally bicuspid, followed by curved bicuspid laterals, towards the margin these laterals show the pectiniform edges characteristic of the genus Jaw straight, with a slightly convex edge

It will be seen that the teeth of this radula differ considerably

from those of S levicula and its allies.

331. Satiella levidensis, Godwin-Austen (Durgella), Mol Ind ii, 1898, p 78, pl 68, figs 6-9 (shell, animal, and radula) [Fig 77, E, F]

This is distinguished from S dekhanensis by its much higher spire, globose form, and smaller size; whorls 4; the spire is exserted and blunt, surface smooth, colour pale green and ochraceous

Major diam 105, axis (not height) 55 mm Another speci-

men measures $13 \times 10 \frac{1}{2} \times 7$ mm.

Hab. Tinnevelly Hills, Travancore.

The lingual ribbon consists of Animal like S dekhanensis about 68 rows, each of about 350 to 400.1 350 to 400 teeth, very closely packed The rhachidian tooth is small, unicusped, lateral teeth long, uniform, and terminally bicuspid, the outermost being serrated on the outer side below the bicuspid apex. Jaw leathery, as in S. dekhanensis.

These South-Indian species are most nearly allied to the

Andaman S. christianæ

332. Satiella flexilis, sp n

Shell imperforate, subglobosely depressed, very soft and flexible, scarcely retaining its shape, smooth, moderately polished, diaphanous, pale greenish; spire low, but apex slightly prominent, blunt, suture shallow; whorls 41, convex, the last rounded at the periphery, slightly turnid beneath; aperture oblique, lunately semiovate, peristome thin, upper margin slightly arcuate, columellar curved, subvertical above

Major diam 13, min. 10½, height about 6½ mm.

Hab Nilgii Hills (Beddome). A shell from Sispara Ghat,

collected by myself, is apparently the same

This is more turned than S pertenues or S. levidenses and is even thinner and more flexible. It can easily be recognized by its greenish colour.

333 Satiella compressa, sp n.

Shell imperforate, depressed, thin, membranaceous, slightly flexible, smooth, with obsolete transverse striction, pale rufescent brown, spire very low, conoidal, apex subacute, suture scarcely impressed. Whorls 4½, flatly convex above, the last bluntly subangulate at the periphery, somewhat flattened beneath; aperture oblique, lunately and subangulately ovate, peristome thin, upper margin arcuate, columellar oblique

Major diam 174, min 142, height 62 mm.

Hab Tirrhiot Ghat, Wynaad.

This is easily recognized by its large size and compressed shape.

334. Satiella pertenuis, sp n

Shell imperforate, depressed, very thin, submembranaceous, smooth, not highly polished, pale yellowish brown; spire scarcely raised, but apex prominent, papillar, suture shallow; whorls 5, at first closely wound, then increasing more rapidly, flatly convex, the last subangulate above the periphery, then rounded, more turnid beneath, aperture oblique, lunately ovate; peristome thin, columellar margin obliquely cuived, finally vertical above.

Major diam 152, min 122, height about 62 mm

Hab Wynaad (Beddome)

This is considerably larger than S. levidensis and with an additional whorl. The last whorl, too, is broader.

*335 Satiella membranacea, Bs (Vitrina) A M N H (2) xii, 1853, p 93, Pfi (Vitrina) Mon Hel iv, 1859, p 792, H \(\cdot \) T (Vitrina) C I 1876, pl 152, fig 10

"Shell much depressed, submembranaceous, obsoletely obliquely stricted, strice very close towards the apex, pellucid, greenish horny, polished, slightly convex above, apex flattened, suture scarcely marginate, whorls 3½, rapidly increasing, the last broad in front, flattened beneath, rounded at the narrow periphery, aperture oblique, ovate, the upper margin arcuate forwards.

"Major diam. 11, min 8, height 4 mm" (Benson, in Latin.)
Hab. Balcadua (apparently a pass of this name), Ceylon.

I have not seen this shell, which is evidently an ally of S dekhanensis, but much more depressed.

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Genus SITALA.

Sitala, H Adams, P Z S 1865, p 408 . Conulema, Stoliczka, J A S B 1871, 2, p 236 Sitala, Godwin-Austen, Mol Ind 1, 1882, p. 25

Type, S infula, Bs.

Range Indo-Malay Region.

"Shell conoidal, thin, consisting of many, usually spirally-ribbed or striated whorls; base convex, narrowly or indistinctly umbilicated; margin of the aperture thin, not expanded; outer

simple." (Stoliczka.)

Typical examples of the genus are more or less trochiform and horny, and, as a rule, surrounded by spiral costulation. A large number of small species may belong either to this genus or to Kahella, or possibly to other forms. As a rule, those referred to Sitala are distinguished by spiral sculpture, sometimes very fine and only visible under a microscope. But in some cases the characters of the radula, despite the presence of spiral sculpture,

have caused the species to be referred to Kahella.

"Animal (of typical species) narrow, long (generally equal to twice the greater diameter of the shell), pedicles long, tentacles much shorter, lateral line (peripodial groove) distinct, the margin beneath it smooth, gland at the end of foot large, superseded by a distinct horn, sole grooved, two shell- and two dorsal lobes to the mantle, all of them small and with no separately produced appendages, but slightly extended on either end, genital organs with or without an amatorial gland; a simple appendix to the penis, produced into the penis retractor; receptaculum seminis (spermatheca) terminating with a bulging end, bedded in the posterior portion of the oviduct and prostata Jaw thin, transparent, smooth, indistinctly or finely concentrically stricted in the Radula large, consisting of numerous (above 100) transverse rows, each with very numeious (300 to above 400) teeth, a very few median teeth being conspicuously larger than the laterals. which are narrow, pecuniform, and very gradually decreasing in width." (Stoliezka)

Unfortunately the animal of only two species (infula and attegra) has been examined. These differ in the presence or

absence of a dart-sac or amatorial organ

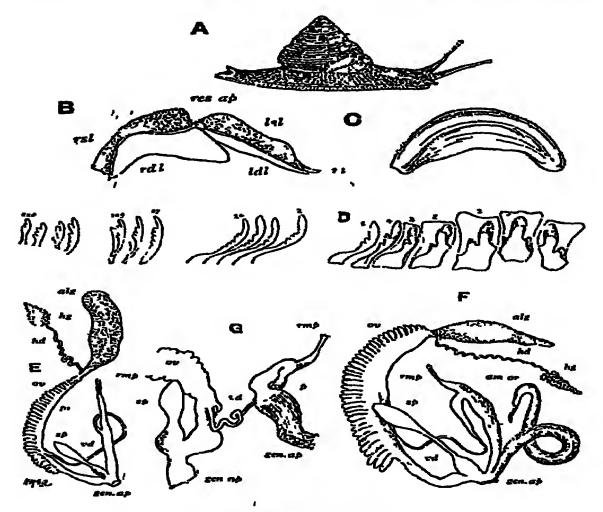
A Typical, subtrockiform or turbinate, spirally ribbed

a Columella slightly reflected.

336. Sitala infula, Bs (Helix) A M N H. (2) ii, 1848, p 160, Pfr. (Helix) Mon Hel iii, 1853, p 58, id vii, 1876, p 103, Stoliczka (Conulema), J A S B 1871, 2, p 239, pl 18, figs 5-9 (shell, animal, and anatomy), 1873, 2, p 16, footnote, H \$ T (Helix) C. I 1876, pl 54, fig 9, Nevill, Nanina (Sitala), Hand-l 1, 1878, p 33, Godwin-Austen, Mol Ind i, 1882, p 26, pl. 8, figs 1-1f (shell, animal, and anatomy).

Helix turbunformis, Bs J A S B vii, 1838, p 218 (no description) nec Pfr 1839

Shell subperforate, subtrochiform, thin, not polished above, faintly striated obliquely, with longitudinal (spiral) raised lines often obsolete on the lower whorls, and finer ribbing intercalated between them, translucent, greyish horny, spire conical, suture



[Fig 78 —Sitala infula

- A Animal from life (after Stoliczka)
- B Mantle-zone, showing shell- and dorsal lobes (after Stoliczka) Enlarged.
- O Jaw × 30
- D Teeth of radula × 475
- E Generative organs (after Stoliczka) Enlarged

Sifala attegia

F Generative organs (after Stoliczka)

Sitala vulcania

G Part of the generative organs ×34]

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impressed; whorls 6, convex, the last angulate, the angulation disappearing near the mouth, base slightly convex, smoother, marked with radiating stries and impressed subdistant concentric lines; aperture subquadrately lunate, very little oblique; peristome simple, straight, columellar margin subvertical, becoming vertical above, and slightly reflected.

Major diam. 7½, min. 7, height 7 mm.

Hab. Throughout Bengal and Orissa. Recorded from Calcutta, Murshidebad, Raniganj, Rajmehal Hills, Patharghatta in Behar, and Talchir in Orissa. Specimens from the last named have 7 whorls, and measure 8 mm. in major diameter and 7½ in height. Nevill includes specimens from Arakan, Bassein, and Moulmein in Burma. Shells are also said to have been found at Poona and in parts of Southern India, but this requires confirmation.

Animal leaden grey with a pinkish tinge, spotted and striped darker. No dart-sac. The vas deferens joins the male organ on the distal side of the retractor muscle, being slightly expanded near the penis, but without kalc-sac or other appendix, and there

is a distinct excum to the muscular attachment.

Jaw finely stricted, arched, scarcely projecting in the middle. Radula containing 150.3 1 3 150 (Stol.)—120.3.1.3.120 (G.-A)—teeth in each row, about 100 rows being present; the seven median teeth are conspicuously larger than the others and bicuspid, the laterals pointed with 2-5 cusps on the outer side.

337. Sitala attegia, Bs (Helix) A. M N H. (3) iii, 1859, p. 184, Theobald (Helix), J A. S. B xxvi, 1857, p 250, Pfr. (Helix) Mon Hel v, 1868, p 91, id t c vii, 1876, p 104, Stoliczka (Conulema), J. A S B 1871, 2, p 237, pl. 18, figs. 1-4 (anatomy), H. & T (Helix) C. I 1876, pl 86, figs 6, 7, Nevill, Nanina (Sitala), Hand-l 1, 1878, p 33, Godwn-Austen, Mol Ind 1, 1882, p 29, pl. 8, figs 2-2f (shell and anatomy)

Shell narrowly perforate, subtrochiform, thin, obliquely striated, and with longitudinal (spiral) subdistant raised lines, stronger on upper whorls, with minute flexuous striation interposed (the latter only seen under a microscope), translucent, pale yellowish or brownish horny; spire conical, suture impressed, whorls 7-7½, convex, slowly increasing, the last carinate, convex beneath, radiately striate, and marked with distant concentric impressed lines; aperture oblique, subquadrately lunate, peristome thin, straight, columellar margin vertical, broadly triangularly reflected, partly covering the perforation

Major diam 10, min 9, height 9 mm Some specimens are 12½ mm. in diameter and 10½ high, others are as small as 6 mm.

ın dınıneter

Hab. Throughout Pegu and Tenasserim, and in Upper Burma, also being found at Bhamo, according to Nevill Recorded also from Ava, Prome, Akouktoung, Moulmein, Ataran Valley, Phiethan Tenasserim Valley, Mergui, and, according to Nevill, Preparis

o 2

Island. Specimens have also been received from the Andamans (var. cadelli, Nev MS) and the Nicobars.

The shell in this species varies much, some are thin and horny with the spiral ribbing almost obsolete, in other cases the shells are thicker and the ribbing strong throughout. From S infula it is distinguished by more open perforation and by lower spire. It is also, as a rule, much larger, with more numerous whorls.

Animal dull whitish, ridge of posterior part of foot grey, mantle-lobes light or sometimes pinkish grey, inner part of mantle with spots and stripes of dark pigment. The dart-sac is present and consists of a strong, tough, twisted tube, spermatheca club-shaped, swollen at the end, then narrowing to a tube, and again swollen near the orifice, vas deferens short and thin, expanding before joining the penis, which is connected with the retractor muscle by a long cæcum. Jaw semicircular, scarcely projecting in the middle of the concave edge. Teeth of radula 200 2.1 2.200, in about 100 rows, middle tooth long, tricuspid? (too many cusps are represented in Stoliczka's figure, he probably made the drawing by eye and not with a sufficiently powerful microscope), the next two broader, but passing into the narrower admedian, having one cusp in the outer edge; the marginals are serrated on the outer edge.

[338. Sitala vulcania, sp. n

Locality. Narkondam Island, Bay of Bengal (G Rogers, Oct

It is interesting to find this genus on this small volcanic cone, lying some 85 miles east of the North Andaman Island I have compared it with S. attegra, var cadelli, Nev MS, from the S Andamans There is considerable difference in form; the Narkondam shell is more sharply keeled than cadelli or typical attegra, and the whorls are more convex, the spire less high Considerable difference is found in the sculpture in the Andaman S. cadelli there is very fine irregular striation on the last whorl, with very regular distinct liration on the apical whorls; in the other, vulcania, there is coarse irregular striation on the last whorl, indistinct liration on the apical whorls, with slight indication of same on the basal side. The animal was in a very good state of preservation. Foot divided, the usual peripodial grooves, and broad fringe below. Head darkish grey, also keel of foot.

There is a very minute right shell-lobe.

The generative organs agree very well with Stoliczka's description and figure of Sitala infula, Bs. The penis and spermatheca are exactly the same, and the amatorial organ is absent, as in that

The radula I was fortunate in extracting complete; it is very broad, having a large number of teeth in one row, the formula being

210 . 2 . 1 . 2 210 212 . 1 212 SITALA. 229

It is also curious to find that this radula is almost the counterpart of Sitala attequa, as described by Stoliczka (vide J. A. S B vol xl, 1871, pt. 2, p. 238), but Stoliczka's figures of the teeth of this genus are very misleading]

339. Sitala culmen, Blf (Nanna) J A S B 1865, 2, p 72, Pfr (Helix) Mon Hel v, 1868, p 94, Godwin-Austen, Mol Ind 1, 1882, p 31, pl 8, fig 4 (shell)

Shell very minutely perforate, trochiform, thin, pale brownish horny, translucent, obliquely striated, and with fine raised, rather distant, spiral lines, closer together near the base of each whorl; 8 or 9 may be counted on the lower whorls, some stronger than others, spire conical, apex obtuse, suture impressed, whorls 6, convex, the last sharply keeled at the periphery, slightly convex beneath, marked with radiating strike and fine concentric impressed lines, aperture slightly oblique, subquadrately lunate, peristome simple, thin, columellar margin vertical, triangularly reflected.

Major diam 5%, min 5%, height 5½ mm.

Hab. Pegu, Akouktoung on Irrawady River, and banks of

Handa Hyoung, west of Henzada

Stoliczka referred this shell to S attegra, and Nevill to S infula. It is distinguished, however, both by smaller size, higher spire, and stronger sculpture.

340. Sitala confinis, Blf (Nanna) J A S B 1865, 2, p 71, Pfr. (Helix) Mon. Hel v, 1868, p 83, H & T (Helix) C I 1876, pl 159, fig 8, Godwin-Austen, Mol Ind 1, 1882, p 32, pl 10, fig 2 (shell).

Shell narrowly perforate, subtrochiform, thin, marked with 3 to 4 distant spiral ribs on each whorl, and obliquely striated, whitish horny; spire conical, with the sides flat, apex slightly obtuse, suture impressed. Whorls 7-7½, the upper slightly convex, the lower nearly flat, last whorl sharply keeled, convex beneath, and finely radiately striated, aperture slightly oblique, subquadrately lunate, peristome thin, streight, columellar margin subvertical, triangularly reflexed

Major diam 10½, min 9½, height 9 mm Hab Thayet Myo and Ava; Burma

From infula, attegra, and culmen this species is distinguished by stronger sculpture, and from and by the sides of the spire being straight, not concave.

341 Sitala arx, Bs (Helix) A M N H (3) iii, 1859, p 184, Theob (Helix) J A S B 1857, p 250; Pfr (Helix) Mon Hel v, 1868, p 90, H & T (Helix) C I 1876, pl 54, fig 8

Shell narrowly perforate, conical, thin, faintly obliquely striated, and each whorl surrounded by about 4 strong, raised, thread-like ribs, smooth beneath, translucent, pale brownish horny; spire conoidal, the sides considerably concave, suture scarcely impressed,

apex acute; whorls 7½, the upper somewhat convex, the lower flat, the last acutely keeled, slightly convex beneath; aperture oblique, subtrapezoidal, peristome straight, thin, columellar margin slightly oblique, triangularly reflected.

Major diam. 10, min 9, height 8 mm.

Hab. Therapum or Therapon Hill, Tenasserim Valley.

Distinguished from all allied forms by the concave sides of the spire and the strong spiral costulation.

342 Sitala palmaria, Bs (Helix) A. M. N. H. (3) xii, 1804, p. 187; Pf. Mon Hel v, 1868, p. 75, H. & T. (Helix) C. I. 1876, pl. 30, figs. 5, 6, Godwin-Austen, Mol. Ind. 1, 1882, p. 35, pl. 10, fig 3.

Shell perforate, subturbinate, marked with spiral ridges, 5 or 6 on the lowest whorl, 4 on the next higher, and with fine oblique regular raised lines above, smooth with radiating strime beneath, whitish horay; spire conoid, with convex sides, apex obtuse, smooth, suture impressed. whorls 5½, convex, the last carnate, moderately convex beneath, aperture oblique, angularly lunate; peristome thin, straight, columellar margin broadly expanded above.

Major diam. 7, min. 64, height 5 mm.

Hab. Nundydroog, in Mysore (Benson), and Wynaad (Beddome). The above is taken from a typical specimen fully grown received from Benson The original type had 6½ whorls and 7 spiral ribs and measured 8½×8×6 mm.

343. Sitala liricincta, Sloliczka (Conulema), J. A. S. B. 1871, 2, p. 241, pl. 18, fig. 10, Pf. (Helia) Mon Hel vii, 1876, p. 104, H. S. T. (Helia) C. I. 1876, pl. 132, fig. 7, Nevill, Nanina (Sitala), Hand-l 1, 1878, p. 34, Godwin-Austen, Mol. Ind. 1, 1882, p. 34.

Shell subobtectly and minutely perforate, turbinate, spirally lirate, with about 4 strong ribs on each whoil, 5 or 6 on the lowest whorl, smoother on the base, with a few concentric raised lines near the periphery, ochraceous horny, spire conical, sides slightly convex, apex obtuse, suture impressed; whorls 6½, convex, the last with a sharp rib representing a keel but not distinctly angulate, convex beneath, aperture nearly vertical, almost semicircularly lunate, peristoine thin, columellar margin slightly oblique, almost vertical and reflected, with a slight projection in front of the perforation

Major diam. 6, min. 53, height 5 mm. (Stoliczka gives

 $6.4 \times 6 \times 5.8$)

Hab. On the banks of the Ataran River, near Moulmein.

Near S. palmaria, but the spiral 11bs are more distant and stronger, the last whorl is less distinctly keeled, the spire is higher, and the whorls more numerous. The animal has not been examined in either species.

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The small projecting point of the reflected columellar margin of the peristome tends to recall that in *Microcystina*.

- b. Columella strongly reflected, thickened, and twisted.
- 344 Sitala ² gratulator, Blf (Namina) J A S B 1865, 2, p 72, Pf; (Helix) Mon Hel v, 1868, p 94, H & T (Helix) C I 1876, pl 16, fig 2 Nevill, Namina (Sitalu), Hand-l 1, 1878, p 33, Godwin-Austen, Mol Ind 1, 1882, p 42, pl 10, figs. 1, 1 a, 1 b (shell).

Shell perforate, trochiform, not very thin, obliquely striated and ornamented with strong spiral (longitudinal) raised lines above and more finely concentrically lined and radiately striate beneath, pale brownish horny; about 6 or 7 libs on last whorl; spire conical, apex obtuse, suture impressed, whorls 5½, slowly and regularly increasing, convex, the last carinate at the periphery, flatly convex beneath; aperture diagonal, subtrapezoidal, breadth exceeding height, peristome thin, inargins united by a callus, basal sinuate, columellar forming a right angle with basal, reflected and thickened above and passing half round the perforation.

Major diam. 5, min 45, height 4 mm

Hab. Irrawady Valley, Pegu. Common about Thayet Myo, also

at Akouktoung and Henzada.

The animal has a small mucous pore at the posterior end of the foot, and a small lobe overhanging the mucous pore. The ey tentacles are long. These characters agree with those of S infula. The very oblique mouth and twisted columella, however, may point to generic differences.

- B. Small shells of doubtful affinity, all under 6 mm. in diameter.
 - a Can mate, subperforate or narrowly perforate
- 345 Sitala gromatica, Godwin-Austen, Mol Ind. 1, 1882, p 32, pl 10, fig 5 (shell)

Shell subperforate, pyramidal, trochiform, obliquely striated and spirally ribbed, with about 10 fine, thread-like, subdistant laised lines, closer together below near the suture, umber-brown; spire conical, sides nearly flat, suture shallow, whorls 7, convex, the last carriate at periphery, lower surface slightly convex, radiately and concentrically striated, aperture oblique, subquadrately lunate; peristome thin, columellar margin oblique, reflected.

Major diam. 31, height 3 mm.

Hab. Manipur, North Cachar, and Khasi Hills.

346. Sitala haroldi, Godwin-Austen, Mol Ind 1, 1882, p. 33, pl 10, fig 7 (shell), id t c ii, 1898, p 47, id P. Z S 1895, p 448

Shell subperforate, trochiform, finely spirally hrate, about 10 spiral lines on the lower whorls, radiately and concentrically stricte on the base, brownish horny, spire conical, sides flat, suture

shallow; whorls 7, slightly convex, the last carinate, nearly flat beneath; aperture oblique, subrhomboidal, peristome thin, columellar margin oblique, forming an angle with basil.

Diam. 3½, height 3 mm.

Hab. Andaman Islands, South Andaman and Little Brother Island; also said to have been found on Katchall in the Nicobars

A small distinctly trochiform shell with fine spiral sculpture [This is the species unnamed, Nanina (Microcystis), No 200, p. 41. Nevill, Hand-1 1, and probably No 208, p 42]

347. Sitala? phyllophila, Bs (Helix) A M N H (3) vi, 1863, p. 320, Pfr (Helix) Mon Hel v, 1868, p 86, H & T (Helix) C 1 1876, pl 61, fig. 10, Nevill, Namua (Microcystis), Hand-l. 1, 1878, p 41

"Shell scarcely perforate, trochiform, thin, silky above, obliquely striated, polished beneath, under the microscope ornamented, both above and below, with minute, close, undulating spiral striction, translucent, pale horny; spire conical, apex rather sharp, suture somewhat impressed, whoils 62, convex, the last carmate, aperture oblique, subquadrately lunate, peristome simple, straight, sharp, columellar margin vertical, reflected, broader above, partly covering the perforation.

"Major diam. 5, min 41, axis 5 mm ' (Benson, in Latin.)

Hab Badulla and Kandy, Ceylon.

This is near S infula, but distinguished by the closely-set undulate strice instead of subremote spiral lines

348. Sitala? pyramidalis, Syles, Proc Mal Soc. 111, 1898, p 70, pl 5, figs 19, 20

"Shell narrowly but perspectively umbilicated, small, depressedly pyramidal, pale horny, slightly covered with an epidermis, apex rather obtuse, whorls 7, plano-convex the first smooth, the others spirally ribbed, the last with 4 to 6 ribs, keeled at the periphery, convex at the base, radiately structed, smooth suture impressed, aperture angularly lunate, peristome simple straight

"Diam 5, height 3 4 mm" (Syles, in Latin) Hab Lower Ambagamuwa, Ceylon (Collett)

349 Sitala? operiens, Sykes, Proc Mal Soc 111, 1898, p 70, pl 5, fig 12.

Shell narrowly perforate, very small, elevately conoid, brownish horny, covered with a brown epidermis, apea rather acute; whorls 6, beneath the epidermis microscopically engraved with numerous spiral lines, the last keeled at the periphery, subconvex at the base, radiately structed, smooth, suture subimpressed; aperture ovately lunate; peristome simple, straight, columellar margin slightly reflected at the perforation
"Diam. 25, height 25 mm." (Syles, in Latin)

Hab. Uva Pussellawa, Ceylon (H. Preston)

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"The sculpture is not visible until the periostracum has been rubbed off"

b. Carinate and umbilicated

350 Sitala? balliana. Godwin-Austen (Nevill, MS), Mol Ind 1, 1882, p 74, pl 15, fig 2 (shell), 11, 1898, p. 48

Shell umbilicated, trochiform, obliquely, finely, regularly striated, spirally costulate, with 4 to 5 strong ribs on each whorl, umberbrown; spire conical, not high, apex blunt, sides slightly convex, suture impressed, whorls 5, convex, the last with a raised keel, slightly convex beneath, aperture subquadrangular, oblique; peristome slightly thickened, columelka margin oblique, becoming vertical above, slightly reflected

Diam. 3½, height 2½ mm.

Hab Hills near Ganjam, Madras Presidency (Ball).

[This is No 193, Nanina (Microcystis), n sp., Nev Hand-l 1, 1878, p 41, type]

c. Rounded or subangulate.

351. Sitala? phulongensis, Godwin-Austen, Mol Ind 1, 1882, p 34, pl 10, fig 4 (shell), id. 11, 1898, p 48

Shell narrowly perforate, elongately conical, subturreted, spirally lirate, with 6 to 7 longitudinal ribs on each whorl, obliquely striated, with radiating and close concentric striation on the base, brownish horny; spire rather high, conical, sides slightly convex, suture impressed; whorls 5½, convex, the last not distinctly carinate, convex beneath, aperture oblique, almost semicircular, peristome thin, columellar margin vertical, slightly reflected

Diam 2, height 225 mm

Hab Khasi Hills, Cherra Pungi, and Phulong.

This is higher in the spire than most of its allies. The lingual ribbon resembles that of Durgella, it has a minute rhachidian tooth and a great number of multicuspid laterals, all similar, the jaw, too, is almost straight.

[S infula and attegua approach Durgella in the form of the lateral teeth, only they have from 7 to 5 central teeth on broad plates]

352 Sitala? limata, Goduin-Austen, Mol Ind 1, 1882, p 34, pl 10, fig 9 (shell)

Shell subperforate, elongately subtrochiform, finely spirally lirate, having about 6 long tudinal ribs on last whorl, closely concentrically striated on base, brownish horny; spire conical, sides convex, apex blunt, suture slightly impressed; whorls 5, convex, the last not carnate, convex beneath, aperture vertical, subquadrately semicircular; peristome thin, columellar margin vertical, slightly thickened and reflected

Major diam. 1½, height 1¾ mm

Hab. Thamandera, base of Arakan Range, Bassem District, Pegu (W. T Blanford)

353. Sitala? subnana, Godwin-Austen (Nevill, MS), Mol. Ind 1, 1882, p 75, pl 14, fig. 6 (shell).

Shell subperforate, conoid, obliquely striated and decussated by fine, rather close, impressed spiral (longitudinal) lines, pale brown, spire conical, rather low, apex obtuse, suture impressed, whorls 4½, convex, the last subangulate, flatly convex beneath, aperture oblique, semilurate, peristome thin, columellar margin slightly oblique and reflected

Diam. 2½, height 1¾ mm. Hab Jessore in Bengal

A small, low conoid shell, subangulate at the periphery.

354 Sitala? crenicincta, Godwin-Austen, Mol Ind 1, 1883, p. 75, pl 13, fig 2 (shell), p 145, pl. 38, figs 4, 4a (teeth of radula)

Shell perforate, depressedly turbinate, thin, obliquely striated and decussated with fine, rather close impressed lines both above and below, brownish horny, when fresh with two spiral parallel rows of fine haus, spire conoidal, apex obtuse, suture well impressed; whorls 4, convex, the last rounded at the periphery; aperture oblique, semiovately lunate, peristome thin, columellar margin vertical.

Diam. 2.25, height 15 mm A larger variety from Mairang

measures 27 by 175 mm.

[The radula is very similar to that of Kahella barrakporcusis, but the outer laterals are not tricuspid. The centre tooth is very large, tricuspid, pointed, broad and long, the admedian teeth are bicuspid, the outer cusp near the base, while in the outermost 3 or 4 it nearly disappears. Few teeth in the row. Formula 18 to 20 5 1.5 18 to 20, or 25.1.25. A variety, slightly larger and very narrowly perforate, from wood at Mairang, Khasi Hills.]

Hab Khasi, Jaintia, and Naga Hills; Marangsip Peak, Jawai,

Terra Ghat, Shillong, &c (Godwin-Austen)

The close impressed lines give the idea of raised ribs between them, especially on the upper whorls

355. Sitala? injussa, W & H Blf (Helix) J A & B 1861, 111, p 356, pl 1, fig 13, Pfr (Helix) Mon Hel v, 1868, p 81, H & T (Helix) C. I 1876, pl 132, figs 5, 6, Nevill, Namua (Microcystis), Hand-l 1, 1878, p 38, Godwn-Austen, Mol Ind. 1, 1882, p 38, pl. 9, fig 5

Shell subperforate, angulately turbinate, thin, marked with rather close, slightly wavy, impressed lines above and below, only visible under a microscope, crossed by fine oblique strim of growth, brownish horny; spire conical, suture impressed, whorls 5½, slightly convex, the last angulate at the periphery, moderately convex beneath, the angulation disappearing near the mouth, aperture oblique, subquadrately lunate, peristome simple, straight, margins converging, columellar vertical, moderately triangularly reflected.

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Major diam 4, min. 32, height 31 mm

Hab Coonoor Ghat, Nilgiris, and the Wynnad From the latter some specimens measure about 41 mm. in diameter

This shell is somewhat like Macrochlamys rimicola.

356. Sitala? srimani, Godinin-Aust.n, Mol Ind 1, 1882, p 41, pl 9, fig. 7 (shell).

Shell minutely perforate, depressedly turbinate, coarsely obliquely striated, with 4 or 5 indistinct spiral (longitudinal) ribs, concentrically ribbed beneath, brown horny; spire conoid, apex blunt, suture well impressed; whorls 5, convex, the last rounded; aperture lunate, columellar margin of peristome oblique, slightly reflected.

Diam 21, height 11 mm.

Hab Manipur

*357. Sitala? placita, Godinn-Austen, Mol Ind 1, 1883, p 74, pl 14, fig 3 (shell)

"Shell, perforation concealed, globosely conoid, sculpture, distant longitudinal ribbing, on the base far apart and well raised; colour pale horny, spire rather high, conic, apex blunt, suture impressed; whorls 4½, convex, last well rounded on periphery; aperture ovate or semicircular; columellar margin suboblique

"Major diam. 2.8, alt axis 2 mm' (Godwin-Austen)

Hab Khasi Hills and Manipur, one specimen from each locality (Godwin-Austen)

The measurements of the figure are: may diam. 3, height

The shell in its form resembles S? sriman, but is not so flat at the base

358 Sitala? intonsa, Godwin-Austen, Mol Ind 1, 1883, p 75, pl. 18, fig 1 (shell).

Shell narrowly umbilicated, depressedly turbinate, obliquely structed, and decussated by close, finely impressed, longitudinal (spiral) lines above and below, closer on apical whorls, wider on the base, yellowish brown; spire conoid, apex obtuse, suture well impressed; whorls 5, rounded, the last whorl broader, rounded at the periphery and below; aperture oblique, semiovate, peristome straight, columellar margin oblique, slightly reflected

Diam. 31, height 21 mm

Hab Marangsip Peak, Khasi Hills (Godwin-Austen).

Said to be hirsute when fresh

359 Sitala? uvida, Godwin-Austen, Mol. Ind. i, 1883, p. 74, pl 13, fig 5 (sheli)

Shell narrowly umbilicated, depressedly turbinate, obliquely

striated, the striation decussated by close, finely impressed, longitudinal spiral lines above and below, yellowish brown, spire conoid, apex obtuse, suture deep, whorls 5, rounded, slowly increasing in size, the last rounded at the periphery and beneath, aperture oblique, diagonal, semiovate, peristome straight, columellar margin oblique, slightly reflected.

Diam. 24, height 14 mm

Hab. Terra Ghat, Khası Hills and Jatınga Valley, North Cachar

Hills (Godwin-Austen).

Near S. srimani, but the spiral sculpture is different and much finer, the shape of the aperture, too, differs considerably.

360. Sitala? recondita, Godwin-Austen, Mol Ind 1, 1883, p 75, pl. 18, fig. 4 (shell).

Shell narrowly and subobtectly perforate, depressedly turbinate, obliquely subcostulate above, on the base finely and closely marked with impressed concentriclines, pale brownish horny, spire conoid, low, apex blunt, suture well impressed, whorls 4½, convex, the last subangulate at the periphery, convex beneath; aperture oblique, roundly lunate; peristome thin, columellar margin oblique, slightly reflected

Diam. 2½, height 1¾ mm

Hab. Raliang, North Jaintia Hills, Jawai, Khasi Hills (Godwin-Austen).

The sculpture is peculiar, oblique, and subcostulate above, concentric only below

d. Longitudinally striated

361. Sitala? rimicola, Bs (Helix) A M N H (8) 111, 1859, p 266, Pfr. (Helix) Mon Hel v 1868, p 71, H & T (Helix) C I. 1870, pl 61, fig. 1, Godwin-Austen (Sitala), Mol Ind 1, 1882, p 36, pl 9, figs 2, 3, & 4 (shells from Mussoorie, Darjiling, and Khasi Hills), 11, 1898, p 48

Shell subperforate, turbinate, globosely conical, thin, fragile, finely obliquely striated and decussated, with close very fine longitudinal impressed lines above and below, translucent, pale brownish horny, spire conical, apex obtuse, suture impressed, whorls 6, convex, the last larger, rounded (sometimes subangulate) at periphery, convex beneath, aperture oblique, semicicularly lunate; peristome thin, straight, columellar margin vertical, reflected

Major diam. 4½, mîn 4, height 4 inm

Hab Landour and Nag Tiba range near Mussoorie in Western Himalayas; Darpling 4000', and various places in the Anghami and Lhota Naga, Khasi, and Gaio Hills south of Assam, Durrang, Assam. Specimens from Sikhim are subangulate, those from Khasi Hills rather larger, from 5 to 5½ mm in diameter.

[Dr. Blanford placed this species in Macrochlamys with doubt,

I retain it in Sitala. The animal is unknown]

[The species honesta was included in Macrochlamys by Dr. Blanford (vide p. 121). I have placed it in a new genus, Sakiella, following Stoliczka, who considered it sufficiently distinct to put it in the genus Dungella, the anatomy of the type of which, levicula, was not then known and which differs materially

Genus SAKIELLA.

Type, S honesta

Range Pegu and Tenasserim.

Differs from Macrochlamys in the form of the teeth of the radula and the formula, the number of the teeth in the low being

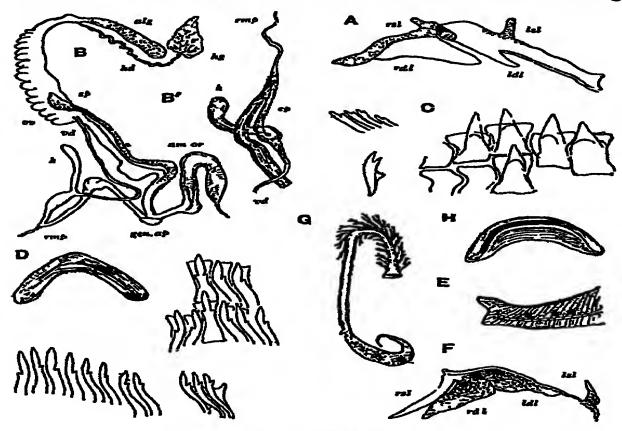


Fig 79 —Holkeion anceps

- A. Mantle-zone removed, showing shell- and dorsal lobes (After Stoliczka)
- B The generative organs (After Stoliczka)
 B' The male organ, × 18. From a Mergui specimen (G-A.)
- Teeth of the radula, × 270 Ditto
- D Jaw, \times 18

Sakrella honesta

- E Extremity of foot From Muleit range, near Moulmein F Mantle-zone, part of, showing shell- and dorsal lobes
- A spermatophore From a specimen from Burmah assigned to honesta, more probably that of M andersoniana, Nevill (After Stoliczka) G A spermatophore
- From a Mulest specimen.
- I. Teeth of the radula. From two Muleit specimens]

The shell has the aperture peculiarly three times as numerous The shell-lobes are as in Macrochlamys. The genitalia have not been satisfactorily worked out, owing to lack of material properly preserved.]

362. Sakrella honesta, Gould (Helix), Proc Bost Soc N. H ri, 1846, p 00, Pf; (Helix) Mon. Hel 1, 1847, p 57, td t c 11, 1859, p 63, td t c 11, 1876, p 19, Bif (Nanina) J A S B 1865, 2, p 87. Stol Macroch'amys (Durgella), J A S B 1871, p 248, pl 17. hgs 6 & 6 a, H & T (Helx) C I 1876, pl 90, fig 10, Newll, Nanna (Macrochlamys), Hand-l 1, 1878, p 24. Godwn-Austen, Mol Ind 1, 1883, p 142, pl 19, figs 7-7 b (details of animal), v Mart Nanna (Durgella), Jon Linn Soc xxi, 1889, p 162 [Vrde fig 79, E-I]

Shell narrowly and subobtectly perforate, depressed, orbiculate, smooth, polished, straw-coloured or whitish horny, translucent; spire depressedly conoid, apex blunt, papillate, whorls 5, slightly convex above, regularly increasing in size, the last usually descending somewhat at the mouth, subangulate at the periphery, convex beneath; aperture diagonal, broadly lunate, peristome thin, the upper margin (in adults) arcuate, columellar not quite vertical above, broadly reflected and slightly thickened, nearly covering the perforation

Major diam. 112, min. 10, height 6 mm

Hab Throughout Pegu and Tenasserim The type was from

The concentric or longitudinal sculpture of fine close impressed lines observed around the perforation by Gould and Stoliczka is easily seen under a microscope in young shells, but not, as a rule, The subangulation at the periphery varies; in the in adults typical form the aperture is angulately lunate

Nevill's var andersoniana [(vide Appendix to Macrochlamys, p 141)] is larger, the subangulation of the periphery is slighter, often scarcely perceptible It measures $13 \times 11\frac{1}{2} \times 7$ in an average specimen. It occurs in Pegu with the typical variety, and appears to be the only form found to the northward and in Assam. var. tenutor (undescribed) is said to be from Preparis Island, north of the Andamans. [Both these are separated as distinct species]

The genitalia are said to be of the usual type, and the spermataphore, figured by Stoliczka, is long, terminating at one end in a trumpet-shaped aperture, and at the other in a sac, and furnished near the former end with horny branching appendages. The jaw is narrow and smooth, with (or, as shown in Godwin-Austen's figure [this was of S honesta], without) an obtuse median projec-The radula has about 23 broad teeth in the middle, with 30 to 35 narrow laterals (30.11 1.11.30); the middle tooth tricuspid, the admedian becoming bicuspid, the outer laterals bicuspid with the points directed outwards [All this refers to Macrochlamys andersoniana (vide p 141)]

[From Stoliczka's description (J A S B. 1871, p. 249) -

"The animal of the Moulmein variety is narrow, very long, pale white, pedicles and the termination of the tentacles leaden grey, as well as the upper part of the foot posteriorly; the tail-gland is superseded by a very distinct hook; the mantle-lobes are well developed, both the upper portions being reflected over the shell. By some accident, however, my spirit-specimens were lost and I am, therefore, unable at present to give sufficient details regarding the anatomy of this species."

The descriptions which follow at the bottom of pp 249 & 250 refer to the animal, anatomy, spermatophore, jaw, and radula of a species from Burma collected by Dr. Anderson, evidently Macrochlamys honesta, var. andersoniana, Nev., which is a distinct

species (vide supi à, p 141, no 192)

The animal (three species observed) from Mule-it Mountain near Moulmein is pale-coloured, a dark line on the upper side of the foot, with three or four conspicuous black spots on the side above the peripodial grooves; these spots when extended in life would appear as dark streaks. The right shell-lobe is long, narrow, and pointed, and there is a small tongue-like left shell-lobe. The visceral sac is spotted, the spots arranged in four parallel rows The genitalia were not well seen, but the amatorial organ was present and the spermatheca was not very long. The jaw is moderately arched, with no median projection. The radula is remarkable for the very large number of teeth in the row. centre tooth is on an elongate narrow plate, tricuspid; the first admedians on similar plates, with a single smull cusp much below the points; the laterals are all alike, becoming smaller towards the margin and unevenly bicuspid, the formula being 153 1.153. or 307 in the row. The jaw and radula are quite distinct from Stoliczka's figures on plate 17, figs. 10 & 14, J. A S B, and Semper's pl 5, fig. 20, Reis. Phil 1870 7

[363. Sakiella? tenuior, Godwn-Austen, Nevill, MS

Macrochlamys honesta, 1 ar. tenuioi, Godwin-Austen, P Z S 1895, pp 441, 146, Nevill, MS, 1d Hand-list, 1, 1878, p 24, 16th line from bottom of page, var. of honesta (8 Moulmein (type var). coll Dr F Stoliczka and W Theobald, 6 Preparis Island, coll Stoliczka)

These shells are in the Indian Museum, Calcutta, and I have not been able to see them.]

[Genus HOLKEION

Type, H anceps, Gould.

Range. Upper Buima, Moulmein, Morgui, and Northern Siam Stoliczka places anceps in the genus Rotula, not considering it sufficiently like Macrochlamys to leave it in that genus. The shell differs very much in character, being sharply carmated at the periphery; the whorls numerous, narrow, flattened, and

sculptured above, smooth and polished on base; narrowly or not perforated. Although possessing shell-lobes, the position of the right shell-lobe is below the inner upper angle of the peristome, and plays only over the lower surface of the shell—a position different from that in Macrochlamys. The animal has a very hooked lobe above the mucous pore

The differences between this genus and Macrochlamys are shown

in the description of the animal of H anceps below.]

364 Holkeion anceps, Gould (Caracolla), Bost Jour N. H. 1v, 1814, p 454, pl 24, fig 4, Pf; (Helix) Mon Hel 1, 1847, p 80, H & T (Helix) C I 1876, pl 30, fig 1, Stol (Rotula) J A & B 1871, 2, p 233, pl 17, figs 1-3 (anatomy), v Mart Namna (Rotularia), Jour Linn Soc xx., 1889, p 161, Godwin-Austen, Proc Mal Soc 11, 1897, p. 174
[Vide fig 79, A-D, p 237]

Shell scarcely perforate, lenticular, sharply keeled, pale horny, dull and obliquely plicately striated above, polished and with fine radiating striation beneath, no longitudinal sculpture, spire low, conoidal, suture not impressed, bordered by a more or less distinct line inside; whorls 6, almost flat above, increasing slowly, the last



Fig 80 — Holkeron anceps

very little broader than the penultimate, convex beneath, compressed beneath the keel; aperture slightly oblique, angulately lunate; peristome thin, basal margin faintly arcuate, columellar oblique, briefly reflected above

Major diam. 16, min. 142, height 72 mm.

Hab Tenasserim, Mergui, Tavoy, and Moulmein; also Sullivan Island, Mergui Archipelago, and Northern Siam

[Found generally on trees and bushes (Stoliczka)]

Animal dark grey with a distinct greenish tinge. Sole divided longitudinally into three tracts, that in the middle broader than the others. Tail-gland with slightly thickened edges and a small hook-like appendage above. The left shell-lobe (fig. 79, A) has below the angular periphery a lingulate process, reflected over the basal part of the peristome, and ends with another shorter process near the shell-retractor, the right shell-lobe has a lingulate process next to the pulmonary opening, and another broader one covering Dorsal lobe well developed Genitalia (B, B') the columellar lip rather peculiar, the dart-sac or amatorial organ is very thick and provided with a strong pointed papilla Spermatheca very long and slender. Vas deferens leading to a kale-sac, which gives off an elongate flagellar appendage close to the junction and leads to the bend of the penis, to which the retractor muscle is attached

There is no trace of the coiled cocum found in typical forms of

Macı ochlamys

The jaw (D) is rather angularly semilunar, smooth, very concave in the middle. Radula of about 75 rows, with about 135 teeth in a row (55.12.1.12.55) the median and admedian rows tricuspid and broad, with the middle cusps prolonged; laterals bicuspid, curved outwards and very pointed. These details are taken from Stoliczka's description, [which is very accurate, but the teeth of the radula are not well drawn]

[Specimens from Mergui sent me by Mr. Theobold which I have dissected confirm Ferdinand Stoliczka's descriptions, with the exception of the radula, in which the median teeth are quite plain and straight-sided, without any trace of the usual cusps, the outer

teeth being bicuspid]

365 Holkeion arata, Blf Namna (Rotula), P Z S 1869, p 418, Pfr (Helix) Mon Hel vii, 1876, p 302, II & T (Helix) C I 1876, pl 84, figs. 8, 9, 10, Navill, Namna (Rotula), J A S. B 1877, 2, p 15.

Similar to *H. anceps*, but much larger, and with considerably stronger plicate oblique sculpture above and radiating striss beneath, not polished below; whorls 7, slightly convex above, the last rather less swollen beneath than in *H. anceps* and somewhat more sunker around the perforation.

Major diam 22, min 20, height 10 mm. Some specimens are

even larger

Hab. Bhamo, Upper Buima. A smaller variety was obtained at Ponsee in Yunnan [var minor of Blanford]

Genus SESARA.

Sesaia, Albers, Heliceen, ed 2, 1860, p 91, Stoliczka, J A S B 1871, 2, p 242

Type, S. infrendens, Gould. [Fig. 81, D-D 2, p. 242]
Range. From the Khasi Hills to Burma and Tavoy, also Western
Siam.

"Shell perforate or imperforate, considly depressed, turbinate or trochiform, typical forms transversely costulate or costulately striated above, smooth and polished below. Several of the species

have teeth in the aperture

"Animal (of S infrendens and S pylanca) long and with a narrow foot; the terminal gland distinct, and a small hooked and pointed appendage above it. The sole has two longitudinal grooves, rather close together, the median portion narrower than each of the outer parts. The mantle-edge is nearly entire; the left shell-lobe is below internally considerably thickened, the left dorsal lobe is very small or almost obsolete; the right shell-lobe thin and somewhat convex, but without separate appendage." (Stoliczka.)

Genitalia (from Stoliczka's description) (fig. 81, D). The re-

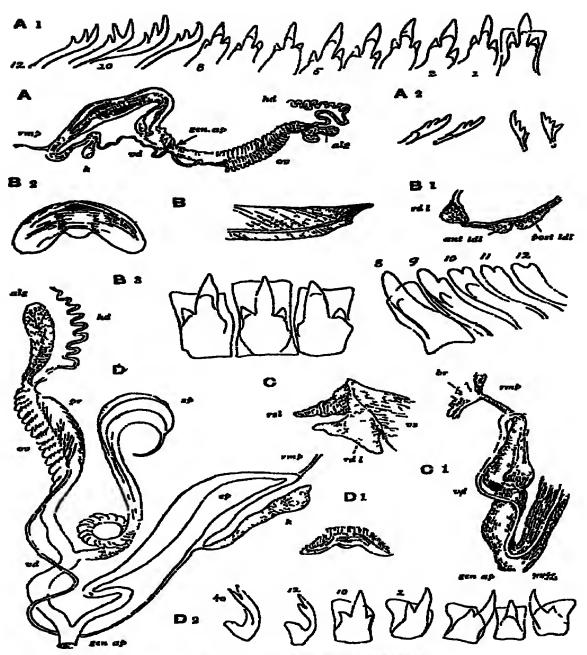


Fig 81 -Kaliella barrakporensis

A 2 Outermost laterals \times 938. Tari of the genitalia.

1 Getl of the radula. $\times 9$ $\times 938$

Microcystina rinki

- B 2 Jaw Extremity of the foot $\times 6$
- B 1 Mantle-edge with dorsal lobes B3 Teeth of the radula. $\times 908$

Microcystina bintennensis

- C Right edge of the mantle, right shell- and dorsal lobes C 1 The male organ × 18

Sesara infrendens.

- D The genitalia (after Stoliczka), much enlarged the spermatheca Spermatophores within
- D 2 Teeth of the radula D1 Jaw

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tractor muscle is attached to the penis some distance (the length of the epiphallus) beyond the junction of the vas deferens, which enters at the base of an appendage corresponding with the kalcsac (k); this sac is about equal in length to the distance between the nunction of the vas deterens and the retractor muscle No cecum of A very long spermatheca, in which three spermatophores of the type usually seen in *Macrochlamys* and its allies were found. No dart-sac.

The jaw (D 1) is narrowed, smooth, with an obtuse projection in the middle of the concave side. The radula (D 2) is composed of about 60 transverse series, with the approximate formula: 50.10.1.10.50. Median tooth small, without lateral cusps, the ten laterals on each side larger than the median tooth, those near the median tooth bicuspid, having a large outer cusp, those towards the exterior tricuspid, outer laterals bicuspid, with an outer denticle near the base, which disappears in the narrow marginal teeth

All the species referred to this generic group are of small size. It is an open question whether S. diplodon and its allies should be meluded; they are arranged here provisionally until their animals The shells of the typical form closely resemble those

of North-American Helicide of the genus Triodopsis

A. Conordly depressed or subturbrnate, costulate or subcostulate above, imperforate or narrowly perforate.

a. Teeth in aperture

a'. Three palatal teeth.

366. Sesara infrendens, Gould (Helix), Bost. Jour N. H. iv, 1844, p 453, pl 24, ig. 6, Pfr Mon Hel 1, 1848, p 152, id vii, 1876, p 276, Stoliczka, J A S B 1871, p 242, pl. 16, figs 4-10 (anatomy), Pfeffer, JB mal Ges v, 1878, p. 272; id Arch d. Naturgesch xliv, 1878, p 425, pl 18, fig 10

Helix capessens, Bs A M N H (2) xviii, 1856, p 250; Pfr Mon Hel iv, 1859, p 194, id vii, 1876, p 306; H & T. C I 1876, pl 60, fig 5 pl 60, fig 5

Helix tickelli, Theobald, J. A. S. B. xxviii, 1859, p. 306; H. & T. C. I 1876, pl 15, fig 3 [Fig. 81, D-D2]

Shell imperforate, depressedly conoid, tawny, arcuately costulate above, the ribbing passing over the periphery and gradually disappearing below. Spire conoid with convex sides, suture impressed; whorls 7, convex, slowing increasing, the last more or less angulated or carmate at the periphery, or sometimes rounded, moderately convex beneath, slightly hollow in the middle, aperture slightly oblique, narrow, with three teeth on the basal margin; peristome slightly thickened, basal margin arcuate.

Major diam. 10, min. 9, axis 5 mm.

Hab. Moulmein and Tavoy.

This shell varies in height of spire, in the roundness or carination of the periphery, and in the teeth. Usually the latter are subequal and nearly equidistant, the middle one being often nearer

to the outer than to the inner. In the variety tickells the middle and outer teeth are close together and united at the base; this form is also rather small and sharply keeled. In capessens, which is also keeled and somewhat depressed (Benson's three measurements are 9, 8, and 4 mm.), the teeth are equidistant.

367. Sesara hungerfordiana, Theobald, J. A. S B 1876, p 184, pl 14, fig 1

Shell imperforate, depressed, sublenticular, pale yellowish horny, finely, closely, and costulately striated above, the ribbing passing over the keel and disappearing on the lower surface, the interior portion of which is smooth and polished, spire low, suture scarcely impressed; whorls 6, flattened above, slowly increasing, the last descending for about one-third of its course, sharply and compressedly keeled, moderately convex beneath, excavated in the middle, the keel finely serrated, aperture very slightly oblique, elongate, margins diverging, joined by a callius; peristome thickened inside, the basal margin arcuate and bearing three subequal and equidistant teeth, the two outer united by a low lamella, the thickening inside the upper and columellar margins also lamelliform

Major diam. 111, min 11, axis 5 mm.

Hab. Mizantoung on the Salwin, near Moulmein

Distinguished by its lenticular form, sharp keel, and descending last whorl.

b' Palatal teeth 2

368 Sesara ataranensis, Theobald (Nanna), J.A. S. B. 1870, p. 401, pl. 17, fig 7, Pfr Mon Hel vu, 1876, p. 578, H. & T. C. I. 1876, pl. 84, figs. 5, 6

Shell imperforate, lenticular, pale chestnut or tawny, costulately striated above, the striation conspicuously more distant on the outer whorls, closer on the inner, and wanting on the innermost, spire convexly conoid, suture not impressed; whorls 7, almost flat above, the last with a compressed keel, moderately convex beneath, the costulate striation passing below the keel and disappearing gradually on the lower surface, which towards the middle is excavated and polished; aperture nearly vertical, angulate externally, narrow and contracted by lamellæ, one in the upper margin increasing in height externally and joining by its base a second, large and almost semicircular, concave in front, which occupied half the basal margin, a third smaller and re-entering, nearer the columellar area, peristome white, thickened inside, basal margin arcuate.

Major diam. 9, min 81, axis 4 mm.

Hab Banks of Ataran River, not far from Moulmein.

Distinguished from S infrendens by finer sculpture, a sharp keel, and very different dentation

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369. Sesara mouleyitensis, Gude, Jour. Mal. vin, 1901, p 15

Nearly allied to S. ataranensis, and having a similar aperture and the same teeth, but larger, conoidly depressed instead of lenticular, and with rounded periphery; basal margin of peristome strongly arcuate, and periomphalus much excavated, whilst the last whorl descends beneath penultimate as in S. hungerfordiana

Major diam. 10, height 53 mm.

Hab Muleyit, almost due east of Moulmein.

370. Sesara bidentifera, Godwn-Austen (W T. Blanford, MS)

Shell imperforate, depressedly conoid, rather solid, yellowish-tawny, arcuately and costulately striated above, the striae passing below the periphery and disappearing on the lower surface, which is smooth and polished; spire conoid with convex sides, suture impressed; whorls 7, increasing slowly, almost flat, scarcely convex, the last bluntly keeled at the periphery, convex beneath, excavated in the middle; aperture oblique, trapezoidal, with its margins diverging; peristome with white labiations inside, the basal margin arcuate, armed with two subequal teeth, columellar margin oblique, slightly expanded

Major diam. 8, min. 7½, axis 5 mm

Hab. Muleyst, west of Moulmien, at 4000 feet elevation (Limborg).

A small form with two simple palatal teeth.

c'. A single palatal tooth and a columellar fold.

371. Sesara ? episema, Ponsonby, Proc Mal Soc 1, 1894, p 56, figs

Shell imperforate, conoidly depressed, thin, brownish horny, subarcuately and costulately striated above, the riblets (snarp and rather irregular) passing over the periphery; lower surface, except near periphery, smooth, polished, radiately striated; spire low, conoid, with convex sides, suture impressed; whorls 7, convex, closely wound, the last bluntly angulate at the periphery, convex beneath, excavated in middle, aperture oblique, almost a rhomboid, with a conical tooth in the middle of the basal margin, and a reentering spiral lamina on the columellar; peristome white, obtuse, columellar margin oblique, scarcely reflected

Major diam 171, min 16, axis 91 min

Hab. Hills South of Assam precise locality doubtful, Asalu, in Western Naga Hills?

b. Aperture contracted by a partetal and a palatal lamella

372 Sesara pylaica, B₈ (Helix) A M N H (2) xviii, 1856, p 249, (3) 17, 1859, p 95 (animal), Pfr Mon Hel 17, 1859, p 164, at c vii, 1876, p 268, 'Stoliczka, J A S B 1871, 2, p 245. H § T C I 1876, pl 15, fig 2

Shell imperforate, conoidly depressed, rather solid, tawny whitish on the periomphalus below, transversely costulate, the ribbing disappearing at the apex, and also on the whitish portion of the lower surface, though continued below the periphery, spire low, conoid, suture impressed, whoris 7-7½, narrow, the last descending a little close to the aperture, subangulate to angulate at the periphery, convex beneath, slightly hollow in the middle; aperture oblique, narrow, curved, contracted by a thick parietal lamella, and by another palatal inside the peristome, extending from its external angle to its columellar insertion, peristome white, thickened.

Major diam. 9, min 8, axis 5 mm.

Hab Farm Caves, Moulmein.

A shell with a remarkable aperture, resembling that of the

North-American Helix hirsuta?

The foot is very narrow, the posterior portion especially so, and it is truncated behind. There is a small mucous pore and a small lobe above it. The mantle-lobes are short, not extending over the surface of the shell. Upper tentacles long, lower short.

c Aperture edentulous

373 Sesara helicifera, W T. Blanford (Nanna), J A S B 1865, p 68, Pfr. Mon Hel v, 1868, p. 241, H. & T. C. I 1876, pl 50, figs 3, 4

Shell imperforate when adult, but with a deep umbilical hollow, perforate in the young, turbinate, rather thin, horny, fulvous, finely, closely, subarcuately, and obliquely costulate above, the costulation passing over the periphery and merging into radiating striations on the lower surface, which is smooth and polished, spire conoid with convex sides, apex obtuse, suture impressed, whorls 7½, closely wound, convex above, the last angulate at the periphery (keeled in the young), flatly convex beneath, with one or more irregular indentations, mostly opaque white from internal callus, at a distance of half a whorl from the mouth; aperture oblique lunate, about twice as broad as high, with a spiral lamina on the columellar margin, extending into the whorls; peristome simple, basal margin slightly arcuate, columellar oblique

Major diam. 10, min 9, axis 7 mm

Hab. Arakan Range west of Prome, Burma Animal dark above, almost black, sole paler Mucous pore very small, but with a lobe above.

374. Sesara mamillaris, W T Blanford (Nanina), J A S B 1865, p 69, Pf, Mon Hel v, 1868, p 88, H S T C I 1876, pl 50, figs 1, 2, Nevill, Hand-l 1, 1878, p 54

Similar to S helicifera, except that the base is perforate and the columellar lamina and indentations on the lower surface are wanting in adults, though they are found in young shells, also

that the spire is lower and the apex slightly acuminate, the base flatter and the periphery of the basal whorl keeled.

Major diam. 10½, min 10, axis 6½ mm.

Hab. Akoutoung, south of Prome, Pegu (W. T. B.), and Arakan Hills (Kurz).

The animal has a small mucous pore and small projecting lobe

above 1t

375. Sesara basseinensis, W. T Blanford (Namna), J.A. S. B. 1865, p. 70, Pfi Mon Hel v, 1868, p. 89, H & T. C. I 1876, pl. 30, fig. 7.

Similar to S. helicifera, but perforate, with a less excavated umbilical region and without any spiral fold on the columellar margin or indentations on the lower surface. Distinguished from S. mamillaris by higher spire, non-acuminate apex, rounded base, and more rounded periphery.

Major diam. 11, min. 10, axis 8 mm.

Hab Southern part of Arakan Range in Bassein district of Pegu.

B. Depressed, carmate, smooth, edentulous

376 Sesara. inermis, Theobald, J. A S B 1876, 2, p 184, pl. 14, fig. 2.

Shell minutely perforate, depressed, sublenticular, amber-coloured, horny, smooth, polished, finely obliquely striated above, subobsoletely and radiately beneath; spire very low, suture impressed, whorls 6½, convex, the outer whorls flattened externally, the last not descending, striately and compressedly keeled, moderately convex below, aperture nearly vertical, rather narrow, sharply angulate at the periphery, without teeth; peristome white, thickened inside, basal margin strongly arcuate, columellar rather sharply curved and vertical at its insertion, scarcely reflected

Major diam nearly 12, min nearly 11, axis 5 mm Hab Salwin Valley, near Moulmein A species of somewhat doubtful affinities.

- C Trochiform, smooth, impersorate or nairowly persorate.
 a. A palatal tooth present.
- 377 Sesara? diplodon, Bens (Helix) A M N H (3) m, 1859, p 187, Pfr Mon Hel v, 1868, p 256, H & T. C I 1876, pl 60, fig 8, Godwn-Austen, J A S B 1876, 2, p 312, Nevill, J A S B 1877, 2, p 17, id Hand-l 1, 1878, ps:53 (pt)

Shell minutely perforate, trochiform, thin, smooth, finely striated and decussated with close microscopic spiral lines throughout, polished beneath, pale horny, spire almost conical, varying

in height, the sides slightly convex, apex rather obtuse, suture slightly impressed, distinctly marginate; whorls 7, increasing slowly, convex, the last not descending, sharply and filiformly keeled, moderately convex below the keel, impressed in the umbilical region, raised into a slightly compressed longitudinal ridge, with a hollow outside it near the basal margin of the peristome, aperture oblique, trapezoidal, with three palatal teeth, the inner subcolumellar, small and conical, the outer lamellar, entering deeply and curved, the portion near the peristome and the innermost portion higher in general than the intervening part, peristome white, obtuse, sharply angulate at the periphery and less sharply in the middle of the arcuate basal margin, columellar margin straight, oblique

Major diam. 64, min. 53, axis 5 mm

Hab Daffa Hills and Hill-ranges south of Assam at low eleva-

tions, Chittagong

The relative distribution of this and of the next two species is not well known, but one or the other is found from Assam and Yunnan to Pegu, the Little Cocos Is, and Preparis

The shell varies in size and in the height of the spire

378 Sesara? harmers, Gude, Jour Mal vii, 1900, p. 139, figs 1, 2

Similar to S. ? diplodon, but distinguished by having the basal surface simply convex behind the aperture, not pinched up into a ridge in the middle, and hollow near the periphery, also in having the outer palatal tooth much shorter and simple, without the inner raised portion.

[Major diam. 675, mm 625, alt. 5 mm., of shell described.]

Hab. Khası Hılls.

379. Sesara i ingrami, Blf (Helix) H & T C I 1876, pl CO, figs 9, 10, Blf J A & B 1880, p 193 Namna (Sesara) diplodon, Nevill, Hand-l 1, 1878, p 53, pt

Very similar to S. ? diplodon, but imperforate and with three palatal teeth, all lamellar. Two are close to the peristome, that on the columellar side is small and runs obliquely inwards, the outer is in the middle of the basal margin where it begins as a thickening inside the lip, then it is sharply curved and passes towards the interior of the whorls—the third is behind the second, it is curved and transversely placed at some distance within the aperture: all are visible through the shell beneath.

Major diam. 61, min. 6, alt 4½ mm Hab. Arakan Range and probably Pegu

The animal has a small mucous pore with a small lobe above it, not quite at the end of the foot, which is flattened posteriorly.

b. Aperture without teeth

380. Sesara? galea, Bs (Helix) A M N H (3) m, 1859, p 388, Pfi Mon. Hel v, 1868, p 264, H. & T C I 1876, pl 54, for 7.

⁹ Sesara harmeri, var anodonta, Gude, Joun Mal vii, 1900, p 140, fixs 5. 6.

This species also closely resembles S. ? diplodon, but the aperture is edentulous and the base flatter; the spire, too, is rather lower.

Major diam. (according to Benson) nearly 9, mm. 8, axis 5½ mm.

Hab. Term Ghat, Khasi Hills

The shell called S? harmen, var anodonta, has a descending last whorl near the mouth, whilst H galea was described as having the last whorl not descending, the spine, too, in the latter is lower but it appears probable that the two are identical

Genus RAHULA

Rahula, Godwin-Austen, Mol Ind 11, 1907, p 216, pl 117.

Type, R macropleures, Bs

Range. Eastern Himilaya; Khasi and Naga Hills; and Arakan. Shell elongately pyramidal or conically trochiform; basal side flat, deeply umbilicated, subangulate around the umbilicus, apex pointed or rounded; costulation strong, close or distant, more or less absent on the apical whorls. Whorls 6-8, more or less carnate on the keel of the last.]

[381. Rahula macropleuris, Bs

Helix macropleuris, Bs A M N. H (3) m, 1859, p 265, Pfr Mon Hel 1, 1868, p 183, H & T C. I. 1876, p 37, pl 87, ing. 10, Godunn-Austen Mol Ind n, 1907, p 216, pl 103, fig 1 (shell)

Kaliella (sec B) macropleuris, Theob Suppl Cat p 20 Nanina (Microcystis) macropleuris, Nevill, Hand-l 1, 1878, p 42

Hab. Bissom Peak, 6410 ft.

Shell figured in Mol Ind.

Major diam. 3 75, alt. 4 75-5 8 mm.

Original description —"Testa subaperte umbilicata, attenuatopyramidata, oblique minute arcuato-striata, superne costis remotis
elevatis arcuatis munita, decorticata, albida, nitidulu; spira pyramidali, superne attenuata, apice papillari, papilla læviori, sutura
carinato-marginata, anfractibus 8, convexiusculis, ultimo non descendente, filoso-carinato, subtus planulato, versus aperturam convexiusculo, circa umbilicum profundissimum, anguste perspectivum,
angulato; apertura obliqua?, transversa, quadrata, peristomate
tenui, recto, mai gine columellari lato, expansiusculo

"Diam. major 5, minor 41, long. 52 mill.

"Habitat in valle Rungun [Rungnu], prope Darjiling, rarissime

"This shell is an exaggeration of the bascauda type of the Khasia Hills, with a more remote costulation and lengthened attenuate spire. The aperture of the single dead specimen collected by Mr. W. T. Blanford is not in the best condition."

Several specimens of this pretty species occur among the shells collected by Mr. W. Robert in the hills east of the Teesta River

also an allied form from Damsang.

[Benson described a species as allied to macropleuris, viz. H. corus. This single dead specimen I find is in the Blanford Collection, which he presented by will to the Natural History Museum specimen has suffered much since Benson described it, and it is

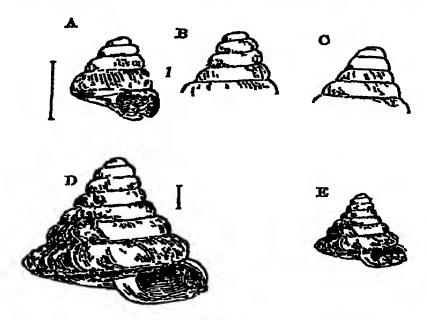


Fig 82

A Rahula corys, Bs Type Young shell, × 9 B Apex of specimen No 34, Blanford's Collection, named macropleurs, × 9

O Apex of R macropleures, Bs, × ?

D R colys Bs, Damsang, \times 6

E Ditto, ditto, × 3.

now only 2 mm. in length; the aperture and last whorls gone I give a drawing of this (fig. 82, A), also one of the apex of a true macropleurs and the Damsang specimen—the three enlarged to I cannot see any appreciable difference bethe same amount tween the apex of corys (fig 82, A) and specimen No 34 (fig. 82, B) The suture is marginate near the apex; the costulation at remote intervals does not begin until the fourth or fifth whorl this form to Benson's H. corys

The apex of typical macropleures (fig. 82, C), it will be seen, is distinctly filose at the suture, even at the third whorl, and the

side of the spire is flatter, very different to fig 82, A & B.

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The shell from Damsang (fig 82, D & E), which I consider corys, differs considerably in other characters from macropleurs. In this last the spire is pyramidal, with flat sides, as in pl. 103, fig 1, Mol Ind ii.; in corys (fig. 82, D & E) the spire contracts more rapidly above the antepenultimate whorl, and the sides are decidedly concave. The distant costulation is stronger; the base is flatter, the columellar margin broader; the aperture is quadrate and smaller; while the umbilicus is also smaller (vide Benson's description, below).]

[382. Rahula corys, Bs
Helix corys, Bs A. M N H 111, 1859, p 265
Kaliella (sec B) corys, Theob Suppl Cat p 20
Rahula corys, Godww-Austen, Mol Ind ii, 1907, p 218, fig 1
(type), fig 4 (shell)

Original description —" Testa perforata, elongato-pyramidali, oblique confertim minutissime costulato-striata, albula, non nitente; spira anguste pyramidali, apice obtusiusculo, sutura impressa, anfractibus 5½, convexiusculis, ultimo ad peripheriam filoso-carinato, basi planiuscula; apertura obliqua?, quadrata, longitudine latitudinem aquante, peristomate tenui, recto, margine columellari verticali, longe vix expansiusculo.

"Diam. 2, long 3 mill.

"Habitat in valle Rungun [Rungnu], prope Darjiling, rarissime occurrens.

"A single dead specimen occurred to Mr W T Blanford. This minute shell is of a type allied to the last-described species in form, but is very differently sculptured. Its more pointed, not papillate apex, and the absence of costulation at somewhat remote intervals, and of a marginate suture, through so many whorls, prove that it is not the young of macropleuris. From the clear horn-coloured Helix fastigiata, Hutton, of the Western Himalaya, it may be known by its narrower spire, decided sculpture, minute size, the absence of a marginate suture, and by its perforate base, and from the dark-coloured H. barrakpoi ensis, Pfr, of the Sikkim Terai, by the first three characters."]

383 Rahula bascauda, Bs (Helix) A M N H (8) m 1859, p 186,

Pfi (Helix) Mon Hel v, 1868, p 256, H & T (Helix) C I
1876, pl 16, fig 1. Nevill (Nanina?), Hand-l 1, 1878, p 42,

[Godwin-Austen, Mol Ind 11, 1907, p 218, pl 117, figs 1,
1 a, 3, 3 a (shells)]

Shell very deeply umbilicated, subtrochiformly couoid, ornamented with oblique rather distant raised ribs above, less raised, closer and flexuous below, rutous horny, spire conical, apex obtuse, suture well impressed; whorls 6½, convex, slowing increasing, the last not descending with a raised keel at the periphery, convex beneath, subangulate around the umbilicus, aperture

slightly oblique, very roundly lunate; peristome thui, columellar and part of the basal margin slightly expanded

Major diam. 4, min 3½, height 3½ mm. Hab. Khasi, Jaintia, and Naga Hills

The above measurements are from a Khasi Hill specimen

Benson's type from Terai Ghat measured $4\frac{1}{2} \times 4 \times 4$ mm This and the next two somewhat resemble Khasiella hyba (no. 254 p 162).

384. Rahula polypleuris, Blf (Helix) J A S B 1865, 2, p 76, Pf; (Helix) Mon Hel. v, 1868, p 186

Helix pachypleuris, Pf; Mon. He' vii, 1876, p 188, [Godwin-Austen, Mol. Ind ii, 1907, p 219, pl 117, fig 2]

This shell is very near R bascauda, but the sculpture is finer and closer, though still regularly costulate ribbing, the spire is lower and the umbilicus rather more open

Major diam. 4, minor 33, height 3

Hab. Arakan Hills, Pegu

A shell from the Jyntia Hills agrees better with this than with the Khasi R. bascauda. This is in favour of Nevill's view that the two are varieties of one form.

[385. Rahula bascaudula, Godwn-Austen, Mol Ind ii, 1907, p 219, pl 117, fig 7 (shell)

Original description —Shell very openly umbilicated, trochiform, flat on base, sharply keeled, with fine carmation; sculpture very close fine costulation, oblique, colour chestnut-brown; spire conoid, apex rather blunt, sides very slightly convex, suture impressed. Whorls 6, aperture quadrate; peristome thin, angulate on lower outer margin, columellar margin subvertical.

Size major diam. 450, alt axis 30 mm

Hab. Risett chu and Richila Peak, Daling District

This shell is very close to that of R bascauda, but placed side by side these differences are to be noted a blunter spire, side of spire more convex, and principally in the umbilicus being very much wider.]

[386 Rahula dafiaensis, Godwin-Austen, Mol Ind ii 1907, p 220, pl 117, fig 5 (shell)

Original description — Shell deeply umbilicated, globosely conoid, sculpture distant, laised, oblique, sinuate costulation; colour pale sienna-brown; spire conic, sides slightly convex, suture moderately impressed. Whorls 7, convex, indistinctly angular at the periphery near aperture, aperture semiovate, peristome thin, the columellar margin scarcely thickened.

Size major diam 42, alt. axis 3.0 mm

Hab. Dikrang Valley, Dafia Hills (Godwin-Austen).

This interesting form can at once be distinguished by the absence of the hrate keel of R bascauda and its allies]

[387. Rahula lhotaensis, Godicin-Austen, Mol Ind 11, 1907, p 220, pl 117, fig. 6 (shell)

Shell openly and deeply umbilicated, pyramidal, base very flat, sharply keeled and carmate, sculpture, costulation close and regular, oblique and sinuate, extending to the basal side; colour rich brown (burnt-sienna), spire conical, apex pointed, sides slightly convex, suture fairly impressed, with a thin liration. Whorls 7, slightly convex, aperture quadrate, oblique; peristome thin, angulate on the lower outer margin, columellar margin subvertical, not thickened, slightly reflected.

Size. major diam 50, alt axis 49 mm Hab. Lhota Naga Hills, Assam (Chennett)

This is a larger species than the type, and can be distinguished by the more pointed apex, pyramidal form, and very flat base, and the costulation is much closer and finer.]

[388. Rahula munipurensis, Godww-Austen, Mol Ind 11, 1907, p 220, pl 117, fig 4 (shell)

Original description.—Shell globosely conic, deeply umbilicated, rounded below the keel, the liration on which terminates at the penultimate whorl; sculpture distant, very strong and very regular costulation, colour pale grey, the ribbing showing bright brown; spire conoid, side nearly flat, apex rounded; suture impressed. Whorls 6, regular, sides very convex; aperture semi-circular; peristome fairly thickened, columellar margin subvertical.

Size major diam. 3.5, alt axis 2 25 min.

Hab. Manipur Hills, north-east of valley (Godwin-Austen)

This is a very distinct little species and the smallest of the genus. I have only found one specimen as yet among the minute Helices I collected in the Munipur Hills]

Genus MICROCYSTINA

Microcystma, Morch, Jour. Conchyl xxiv, 1876, p 357, Godwin-Austen Mol Ind i, 1882, p 11 (shells and anatomy), 11, 1899, p 110

Type, M. rinki, Morch.

Range. The greater part of the Indo-Malayan Region, but within British Indian limits recorded only from the Andaman and Nicobar Islands, Ceylon, Southern India, and Western Bengal.

Shell thin, horny, depressed to globosely depressed, and only distinguished from *Macrochlamys* by having the columellar margin of the peristome more broadly reflected and furnished with a projecting angular process which covers the perforation partially or wholly. All Indian forms exhibit microscopic longitud struction.

Animal imperfectly known, somewhat similar to Macias regards the right shell-lobes and mucous glan

overhanging pointed process as in that genus. In the genitalia it differs from Macrochlamys in that the male organ is simple and the retractor muscle is attached without any cacum. The dart-sac was observed in M. rinki, but not in M bintennesss. In the former it was shorter than the spermatheca, which was an elongate sac.

Further detailed examination of the animal of the Andaman and Nicobar species is desirable.

A Species from Nicobar Islands.

389. Microcystina rinki, Morch (Nanina), Journ Conchyl 17, 1872, p 811, 1217, 1876, p 856, Pfr (Helix) Mon Hel vii, 1876, p 142, Nevill, Nanina (Microcystis), Hand-l i, 1878, p 39, Godwn-Austen, Mol Ind 1, 1882, p 12, pl 3, figs. 1-7 (shell and anatomy)
[Vide fig. 81, B-B 3, p 242]

Shell very narrowly and obtectly perforate, convexly depressed, thin, smooth, highly polished, with fine, longitudinal, parallel, microscopical striation above and below; brownish horny, rather paler and whitish beneath, spire convexly couoid, suture impressed, whorls 5, convex, the last descending slightly and gradually towards the mouth, rounded at the periphery, turnid beneath, aperture oblique, lunate; peristome thin, columellar margin oblique, thicker, and rather broadly reflected, with a salient angular process nearly closing the perforation.

Major diam. 55, min. 5, height 3.5 mm

Hub The Nicobar Islands. Recorded from Great Nicobar (Morch), Little Nicobar (Busch), Katchal Camorta, Car Nicobar,

and Teressa (de Reepstorff)

In the animal the left dorsal lobe is in two parts. The dart-sac is present. The teeth on the radula are 35 to 40.2.7.1.7.2.35 to 40, or about 47.1.47: the inner laterals broad, elongate, and sharp, each with one cusp on the outside, none inside, outer laterals each with two terminal blunt cusps.

B Species from Andaman Islands

390. Microcystina moerchiana, Godioin-Austen (Nevill, MS), Mol Ind 1, 1882, p 13, pl 8, fig 9 (shell), n 1898, p 47 Microcystina hoch-tetteri, Godioin-Austen, A M N H (6) 11, 1888, p 57

Shell imperforate, conoidly depressed, thin smooth, highly polished, very finely and closely stricted longitudinally beneath the microscope, brownish horny, paler beneath around the umbilical region; spire conoidal, apex obtuse, suture almost flat, scarcely impressed; whorls 5, slightly convex, the last not descending, rounded at periphery, rather turnid beneath; aperture very slightly

oblique, rather broadly lunate, peristome thin, columellar margin broadly reflected, vertical for a short distance above, the sakent process closing the perforation of the shell.

Major diam. 73, min. 7, height 4½ mm

Hab. Kondul Island, Nicobar Group; north coast of Great Nicobar.

This is the largest species yet described from the Nicobar or Andaman Islands.

391. Microcystma warnefordi, Godwin-Austen (Nevill, MS), Mol Ind 1, 1882, p 13, pl 3, figs 8, 8 a (shell and sculpture), 11, 1898, p 47, 1d P Z S 1895, p 447

Shell obtectly perforate (almost imperforate), depressed, thin, polished, smooth, with very fine, close, and regular, longitudinal, microscopic striation, umber-brown; spire low, conoidal, suture shallow; whorls 5, convex, the last rounded at periphery, convex beneath, aperture nearly vertical, lunate; peristome thin, columellar margin oblique, reflected, and with an angular projection which nearly closes the perforation.

Major diam. 4, min 34, height 2 mm.

Hab Port Blair and the Brothers, Andaman Islands.

"Jaw very curved, central projection well developed. Animal black, with well-developed right shell-lobe, and large lobe over the mucous gland" (Godwin-Austen.)

392 Microcystina harrietensis, Godwin-Austen (Newll, MS), Mol Ind 1, 1882, p 13, pl 3, figs 11, 11 a (shell and sculpture)

Shell imperforate, subglobosely depressed, smooth, not highly polished, with longitudinal, distinct, rather distant striation throughout under the microscope, umber-brown; spire conoidal, convex at the sides, apex obtuse, suture impressed; whorls 5, convex, slightly increasing, the last not descending, rounded at periphery and beneath; aperture subvertical, lunate, peristome thin, reflected, with an angulate projecting process covering the perforation of the shell.

Major diam 23, axis 13 mm

Hab. Mount Harriet, Port Blair, S. Andaman Island.

393 Microcystina stewarti, Blanford (stuarti, Godwin-Austen, MS), P Z S 1904, 11, p. 440, pl 25, fig 16 (shell)

Shell imperforate or subperforate, convexly depressed, very thin, smooth, highly polished, with faint transverse lines of growth and very fine, parallel, not very close, longitudinal, microscopic striction above and below, yellowish brown; spire low, convexly conoid, suture scarcely impressed; whorls nearly 5, flatly convex above, the last not descending, rounded at the periphery, convex below; aperture oblique, lunate; peristome thin, columnia margin

oblique, reflected above into an angulate process that closes the perforation

Major diam. 4½, min 4, height 2½ mm.

Hab. Andaman Islands.

This form is near M. inki, from the Nicobars, but it is smaller, rather thinner, more closely wound, and imperforate. The spiral sculpture is less strong and less regular.

[Named after General Sir Donald Stewart, at one time Governor of the Andaman Islands. M stuarts was adopted by Blanford in

error.]

C Species from Peninsular India and Ceylon

394 Microcystma bintennensis.

Microcystina perfucata, im bintennensis, Godwin-Austen, Mol. Ind 11, 1899, p 110, pl 92, figs 3-3: (shell and anatomy)
Microcystina perfucata, Bs., Godwin-Austen, t. c. p 110, pl. 92, fig 4 (columella of shell) nec Helix perfucata, Bs.

[Vide fig 81, C, C1, p. 242]

Shell obtectly perforate, depressed, translucent, polished, very finely, closely, and faintly spirally striated under the microscope, most distinctly on the upper whorls, rich deep brown, spire low, convexly conoidal, apex obtuse, suture shallow; whorls 4½-5½, convex, the last broader, rounded at the periphery, convex beneath; aperture oblique, elliptically lunate; peristome thin, in one plane, columellar margin oblique, slightly curved, reflected and angulately projecting above, partly covering the perforation.

Major diam 62, mm. 53, height 3 mm.

Hab. Ceylon, Bintenne (Collett), Badulla, 2000', Matale, 1800'

(Collett); Dumballa (Collett).

In the animal the mucous gland is linear, with the end of the foot projecting above it. Peripodial margin broad; sole divided. Right shell-lobe present, no left shell-lobe; left dorsal lobe in two separate flaps. Jaw with a large projection in the middle. Teeth 30.1.3.1.8.1.30 (39.1.39). Male organ a simple straight sheath tapering above to the retractor muscle, and apparently destitute of kalc-sac. According to the figure the vas deferens joins the penis on the distal side of the retractor muscle. [This is only apparent, the retractor muscle is very long and extends to the junction of the vas deferens.]

This cannot be the same as Macrochlamys perfucata, Bs, from Galle, though the two were united by Godwin-Austen. Benson's species has four closely-wound whorls, the aperture scarcely oblique,

and the columellar margin vertical

395. Microcystina shevaroyana, W T Blanford, P. Z S 1904, 11, p 446, pl 25, fig. 17.

Shell rather openly and perviously perforate, conoidly depressed, thin, translucent, amber-coloured, polished, with very minute, close, and rather flexuous longitudinal (concentric) striation above and below; spire conoidal, slightly raised, suture impressed; whorls 6, convex above, the last rounded at the periphery, rather flatly convex beneath; aperture slightly oblique, rather broadly lunate; peristome thin, the upper and basal margins faintly arcuate, columellar oblique, obtuse, expanded and slightly reflected above, with a very slight salieut angle, not always recognizable, near the perforation.

Major diam 84, min. 72, height 4 mm.

Hab. Shevaroy Hills, Madras Presidency (Daly).

Near M. bintennesses, but larger and distinguished by more open perforation, much paler colour, and more numerous whorls

There is also much resemblance to Macrochlamys vilipensa, but that has only five whorls, and a differently-shaped aperture and columellar margin.

396. Microcystina lita, Syles, Proc Mal Soc. in, 1898, p 70, pl 5, figs. 10, 11, Godiom-Austin, Mol Ind ii, 1899, p 111, pl 92, figs 1-1 c (shell and sculpture)

Shell narrowly and obtectly perforate, convexly depressed, thin, smooth, polished, under the microscope rather distantly striated with spiral (longitudinal) impressed lines above and below, pale tawny; spire convex, obtuse, suture impressed, whorls 4½, increasing regularly, the last rounded at the periphery and convex beneath; aperture slightly oblique, lunate, peristome thin, columellar margivertical above, slightly reflected and thickened, with a small and blunt salient angle.

Dam. 34, height 2 mm.

Hab. Ambagamuwa (Collett).

*397. Microcystina cryptomphalus, Godwin-Austen (Newll, MS), Mol. Ind. 1882, p 13, pl. 111, fig 10 (shell and sculpture)

Shell perforate, conoidly depressed, flat on base, marked with fine, regular, parallel, spiral (longitudinal), impressed lines under the microscope, pale brown; spire conoidal; whorls 5, regularly increasing, aperture lunate; peristome thin, reflected and angulate at columellar margin

Major diam. 3.1, axis 1.5. (Description chiefly copied from

original.)

Hab. Pareshnath Hill, Western Bengal, 4480'.

Genus KALIELLA

Kahella, Bif A M N. H (3) x1, 1863, p 83; Stol J. A S B x1 2, 1871, p 287, Godwn-Austen, Mol Ind 1, 1882, pp 1-10, 19-24 1883, pp 68-73, 146; id t. c. 11, 1907, pp 174-177.

Type, K barrakporensis, Pfr. [Fig 81, A-A 2, p. 242]
Range Indo-Malay and Mascarene Regions.
Shell narrowly perforate or imperforate, conical and when

typical trochiform, small, thin, horny, as a rule obliquely subcostulate or striated, and not spirally above; whorls increasing

slowly, the last very little larger; peristome thin.

The animal of only one species, K. barrakporensis, is known and this very imperfectly. It is much like that of Sitala, and has a distinct caudal gland with a lobe above it. There is, however, no dart-sac, and there is a pear-shaped kalc-sac at the junction of the vas deferens with the penis; no cacum leads to the retractor muscle, which is attached to a fold. The spermatheca has not been described. The radula differs from that of Sitala in the small number of teeth in each row (67 in K barrakporensis, against 307 in S. infula or 405 in S. attegra) and in the larger number of broad admedian teeth.

Unfortunately so few animals have been examined that the generic position of several species included in the genus must remain very doubtful; this is more especially the case with those allied to K.? nana. It is quite uncertain whether several of the small forms attributed to Sitala should not be assigned to the present genus and vice versa, nor can any line be drawn to discriminate between the small shells of those two genera and the smaller species included in Macrochlamys.

I Imperforate or narrowly perforate.

A. Trochiform, carinate at periphery.

s. Height and diameter nearly equal.

398 Kaliella barrakporensis, Pf: (Helix) P Z S 1852, p 156, id. (Helix) Mon Hel in, 1853, p 59, id t c iv, 1859, p 33, id t. c v, 1868, p 86, id t c. vii, 1876, p 100; Bs (Helix) A M. N H. (3) iii, 1859, p 272, W. & H. Blf. J A S. B. xxx, 1861, p 358, Blf. A M N. H. (3) xi, 1863, p 83, Stol J A S B xl, 2, 1871, p 237, H. & T. (Helix) C I 1876, pl 87, fig 7, Nevill, Nanina (Microcystis), Hand-l i, 1878, p 41, Theobald, J A S B 1878, 2, p 142, Godwin-Austen, Mol Ind i, 1882, pp 2, 19, pl 1, figs 1-4 (shell), pl 2, fig 1 (shell), pl 5, fig 11 (radula), 1883, p. 146, pl 38, fig 5 (genitalia).

Helix sivalensis, Hitton, MS, Bs l c, Godwin-Austen, Mol. Ind i, 1882, pl. 1, figs 3, 3 a, pl. 2, fig. 1 (shells)

Shell subperforate, pyramidally trochiform, thin, obliquely striated [or rather microscopically costulately ribbed] above, concentrically and fairly closely marked with impressed lines on the base, smooth, translucent, horny brown; spire conical, sides very slightly convex, suture impressed; whorls 6, convex, slowly increasing, the last keeled, not descending, slightly convex beneath; aperture oblique, subquadrately lunate, peristome simple, thin, straight; columellar margin slightly oblique, reflected, concealing perforation.

Diam. 3½, height 3½ according to Pfeiffer, but varying, and

height often less than diameter.

Hab. Himalayas, Bengal, Deccan, S. India, Burma?, Ceylon, Localities recorded are: Kashmir (Theobald); Mussoome, 7000 feet (Godwin-Austen); Doon below Landour (Hutton); Sikhim, Pankabari, and Rangnu valley (W. T. Blanford), and Titalya (Bacon); Pareshnath Hill and Patarghatta (Stoliczka); Barrackpore (Bacon); near Calcutta (Stoliczka, Nevill); Khandalla near Bombay (W. T. B); Madras (Ramanan); Kalryenmullay Hills near Salem (Foote); Pedro Talle Galle, Ceylon (?); Barisal, Bengal (Godwin-Austen) Nevill also quotes shells from Teria Ghat, Thayet Myo, Prome, and Pegu, but these may belong to other nominal forms. Several specimens have, however, been obtained from Madagascar; and, from this locality, they cannot have been introduced by man. The occurrence of this shell in Lower Bengal has been doubted, but both Stoliczka and Nevill found it near Calcutta. Shells from Bhore Ghat (Khandalla) are intermediate between K. barrakporensis and K. sigurensis.

Animal of a pale colour, with a distinct gland at the extremity of the foot, overhung by a well-defined lobe. Mantle-lobes not observed. Parts of the genitalia are figured in the 'Land and Freshwater Mollusca of India,' showing the small pear-shaped kalc-sac [see also fig 81, A, p. 242, suprà] [The teeth of the radula are peculiar—from the small number of broad plated admedian teeth in the row, all tricuspid, the outer cusps both basal, the central point long; the laterals are narrow, much curved, and also tricuspid; the outermost minute and tricuspid,—with this formula:

26 . 7 . 1 . 7 . 26 (33 . 1 . 33).]

399. Kaliella sigurensis, Godwin-Austen, Mol Ind 1, 1882, p 5, pl 1, fig 11 (shell)

This only differs from K. barrakporensis in having distinctly oblique radiating strie on the base and not concentric microscopical impressed lines. In all probability the two pass into each other, an intermediate form having already been noted from Khandalla near Bombay.

Hab Sigur Ghat and Neddiwatam Ghat, Nilgiri Hills.

[400. Kaliella rissomensis, Godwin-Austen, Mol. Ind 11, 1907, p 174, pl 103, fig 9 (shell)

Locality Rissom Peak, Richila Peak, and Damsang Peak, Daling District.

Original description.—This shell is like K. sivalensis in general form, but placed alongside of it under the microscope difference is apparent in proportion of diameter to height of spire and form of columellar margin. The sculpture is also coarser.

Size: maj. diam 35, alt. axis 2.6 mm.]

401. Kahella vulcani, Godum-Austen, Mol. Ind 1, 1882, p. 6, pl 1, fig 13 (shell)

This only differs from *K barrak porensis* in having slightly convex sides to the spire, a blunter apex, and rather more rounded whorls

Diam 3, beight 2½ mm.

Hab. Puppa-doung near Pagan, Upper Burma (W T B).

The only shell is not in good condition, and in better preserved specimens there might be concentric striction on the base. It is probably a variety of K. barrakporensis

402 Kahella jaintiaca, Godwin-Austen, Mol Ind 1, 1882, p. 7, pl. 2, fig 4 (shell).

Shell subperforate, trochiform, thin, very minutely obliquely striated, and with very fine concentric strim on base, pale horny brown; spire conical, sides nearly straight, apex obtuse, suture impressed; whorls 5½, convex, the last sharply keeled, convex below; aperture slightly oblique, angulately lunate; peristome thin, columellar margin vertical.

Diam 31, height 3 mm.

Hab. Marangsip Peak (5350') and Sherfaisip Peak (5600'),

South Jaintia Hills.

This is near barrakporensis, but the spire is lower and more convex at the side, and the base is more turned and the aperture higher and more open

[403. Kaliella jaintiaca, var., Godwin-Austen, Mol. Ind ii, 1907, p 174, pl 103, fig 10 (shell)

Locality. Hengdan Peak, N. Cachar Hills (Godwin-Austen)

Original description —The typical species was found by me on Marangsip Peak, Jaintia Hills, at 5350 feet. The species now figured is from the Naga Hills and is the nearest approach I can find to it, yet it differs somewhat, particularly at the columellar margin, which is more oblique.]

404 Kaliella cheriaensis, Godwin-Austen, Mol Ind 1, 1882, p 4, pl 1, fig 5 (shell) (nec Nanina cherraensis, Bif J A S B 1870, p 14)

Shell narrowly perforate, high trochiform, thin, obliquely striated, with microscopic parallel impressed lines above, below decussated with radiating and concentric strie, brownish horny, spire conoidal, rather high, sides convex, apex obtuse, suture impressed, whoils 6, flatly convex above, the last carinate, almost flat beneath, aperture oblique, subquadrately lunate, peristome thin, columellar margin oblique, reflected.

Diam. 3, height 37 mm.

Hab Garo, Khasi and Naga Hills to south of Assam, and
Dafla Hills to north.

KALICILA 261

The specimen measured above, from Teria Ghat, is rather large; other shells are about 25 to 27 mm in diameter. This form is distinguished from K barrakpoi ensis by a somewhat higher spire, more convex at the sides

405. Kaliella manipurensis, Godwin-Austen, Mol Ind. 1, 1882, p 5, pl 1, figs 9, 9 a (shell and sculpture), 10 (vai.), pl 2, fig 3 (shell).

Shell subperforate, high trochiform, slightly polished, closely and obliquely ornamented under the microscope with raised stries, on the base decussated with very minute concentric stries and radiating lines, brownish; spire high, conoidal, sides convex, apex obtuse, suture impressed, whorls 6½, convex, the last sharply carnate, base slightly tumid, aperture slightly oblique, almost senicircular, columellar margin well reflected, vertical above

Diam. 23, height 3 min.

Hab. Manipur Hills and Phunggim, Lahupa Naga Hills, 5000 ft (Godwin-Austen).

The form from the Naga Hills is a little smaller, with 5½ whorls.

Some shells measure 3 mm in diameter.

"This shell differs from the Cheria and Khasi species (K. cnerraensis) in the whorls being more convex, more turned below, and the columellar margin not so oblique. It is nearest in shape to K. aspu ans of Southern India." (Godwin-Austen.)

406 Kaliella khasiaca, Godwin-Austen, Wol Ind 1, 1882 p 5, pl. 1, fig 8 (shell).

Shell imperforate, high trochiform, very closely obliquely ribbed above, smooth on base, brownish horny, spire conical, sides rather convex, whorls 7½, convex, the last angulate, slightly turned beneath, aperture subquadrately lunate, peristonic thin, columellar margin vertical

Diam. 225, height 275 mm. Hab North Khasi, common.

This is distinguished from *cherraensis* and *manipurensis* by not having a raised keel at the periphery, by more numerous whoils, and by want of concentric sculpture on base.

407. Kaliella costulata, Godicin-Austen, Mol Ind. 1, 1882, p 7, pl 2, fig 5 (shell)

Shell imperforate (subperforate), trochiform, thin, translucent, polished, ornamented with oblique distant libbing, stronger than usual above, and very fine concentific struction beneath, pale horny brown, spire conical, sides straight, suture scarcely impressed; whorls 6½, rather flat, the last culmate, flatly convex beneath; aperture slightly oblique, subquadrately lunate; peristome thin, columellar margin vertical, reflected.

Dam 23, height 3 mm

401. Kaliella vulcani, Godwin-Austen, Mol. Ind 1, 1882, p. 6, pl 1, fig 13 (shell)

This only differs from K barrak porenss in having slightly convex sides to the spire, a blunter spex, and rather more rounded whorls.

Diam 3, beight 2½ mm.

Hab. Pappa-doung near Pagan, Upper Burma (W. T B.).

The only shell is not in good condition, and in better preserved specimens there might be concentric striction on the base. It is probably a variety of K. barrakporensis.

402 Kaliella jaintiaca, Godinin-Austen, Mol Ind i, 1882, p. 7, pl. 2, fig. 4 (shell).

Shell subperforate, trochiform, thin, very minutely obliquely stricted, and with very fine concentric strice on base, pale horny brown; spire conical, sides nearly straight, apex obtuse, suture impressed, whorls 5½, convex, the last sharply keeled, convex below; aperture slightly oblique, angulately lunate, peristome thin, columellar margin vertical.

Diam 31, height 3 mm.

Hab. Marangsip Peak (5350') and Sherfaisip Peak (5600'),

South Jaintia Hills.

This is near barrakporensis, but the spire is lower and more convex at the side, and the base is more turned and the aperture higher and more open

[403. Kaliella jaintiaca, var., Godwin-Austen, Mol. Ind n, 1907, p 174, pl 103, fig 10 (shell)

Locality Hengdan Peak, N. Cachar Hills (Godwin-Austen)
Original description —The typical species was found by me
on Marangsip Peak, Jaintia Hills, at 5350 feet. The species now
figured is from the Naga Hills and is the nearest approach I can
find to it, yet it differs somewhat, particularly at the columellar
margin, which is more oblique.]

404. Kaliella cherraensis, Godwin-Austen, Mol Ind 1, 1882, p 4, pl 1, fig 5 (shell) (nec Nanina cherraensis, Blf J A S B 1870, p 14)

Shell narrowly perforate, high trochiform, thin, obliquely striated, with microscopic parallel impressed lines above, below decussated with radiating and concentric striæ, brownish horny, spire conoidal, rather high, sides convex, apex obtuse, suture impressed, whoils 6, flatly convex above, the last carinate, almost flat beneath, aperture oblique, subquadrately lineate, peristome thin, columellar margin oblique, reflected

Duam. 3, height 3½ mm

Hab. Garo, Khasi and Naga Hills to south of Assam, and

Dafia Hills to north.

KALIELIA 261

The specimen measured above, from Teria Ghat, is rather large; other shells are about 25 to 27 mm. in diameter. This form is distinguished from K. barrakporensis by a somewhat higher spire, more convex at the sides.

405. Kahella manipurensis, Godwin-Austen, Mol Ind. 1, 1882, p 5, pl 1, figs 9, 9 a (shell and sculpture), 10 (vai), pl 2, fig 3 (shell).

Shell subperforate, high trochiform, slightly polished, closely and obliquely ornamented under the microscope with raised stries, on the base decussated with very minute concentric stries and radiating lines, brownish; spire high, conoidal, sides convex, apex obtuse, suture impressed; whorls 6½, convex, the last sharply carnate, base slightly tumid, aperture slightly oblique, almost senicircular, columellar margin well reflected, vertical above

Diam. 23, height 3 min.

Hab. Manipur Hills and Phunggam, Lahupa Naga Hills, 5000 ft (Godwin-Austen).

The form from the Naga Hills is a little smaller, with $5\frac{1}{2}$ whorls.

Some shells measure 3 mm in diameter.

"This shell differs from the Cherra and Khasi species (K cnerraensis) in the whorls being more convex, more turned below, and the columellar margin not so oblique. It is nearest in shape to K. aspu ans of Southern India." (Godwin-Austen)

406. Kaliella khasiaca, Godwin-Austen, Wol Ind 1, 1882 p 5, pl 1, fig 8 (shell).

Shell imperforate, high trochiform, very closely obliquely ribbed above, smooth on base, brownish horny; spire conical, sides rather coniex. whorls 7½, convex, the last angulate, slightly tumid beneath, aperture subquadrately lunate, peristome thin, columellar margin vertical.

Diam 2 25, height 2 75 mm. Hab North Khasi, common.

This is distinguished from *cherraensis* and *manipurensis* by not having a raised keel at the periphery, by more numerous whorks, and by want of concentric sculpture on base.

407. Kaliella costulata, Godwin-Austen, Mol Ind. 1, 1882, p 7, pl 2, fig 5 (shell)

Shell imperforate (subperforate), trochiform, thin, translucent, polished, ornamented with oblique distant libbing, stronger than usual above, and very fine concentric striction beneath, pale horny brown; spire conical, sides straight, suture scarcely impressed; whorls 6½, rather flat, the last carinate, flatly convex beneath; aperture slightly oblique, subquadrately lunate, peristome thin, columellar margin vertical, reflected

Diam. 23, height 3 mm

Hab. Tanır Ridge, Dafia Hills, N. of Assam, also Hengdan Peak, North Cachar Hills S of the Assam valley (Godwin-Austen). Distinguished by its well-marked costulation.

408. Kaliella subcostulata, Godwin-Austen, Mol Ind. 1, 1882, p 8, pl. 2, fig 6 (shell)

This is very near costulata, but the ribbing is not quite so regular or so strong, the concentric striction on the base is more distant, the shell is smaller, the whorls are convex, and the suture well impressed.

Diam 2½, height 2½ mm Hab. North Khasi Hills.

*409. Kaliella salicensis, Godwin-Austen, Proc Mal. Soc 11, 1897, p 178, pl 14, fig 3 (shell)

"Shell perforate, conical; sculpture irregular, coarse, transverse ribbing, periostracum umber-coloured, spire conic, flat-sided, sutui e very shallow; whorls 7, sides rather flat, aperture quadrate, straight below; peristome suboblique, columellar margin reflected.

"Size: major diam 28, alt. 3" (Godwin-Austen)

Hab Uda Pussalawa, Ceylon (H. B Preston)

"The whorls of this species do not increase in breadth so much as in K barrakporensis; the fine regular transverse sculpture is absent, rougher irregular ribs taking its place. The base of the Ceylon shell is not so broad, in proportion to the height of the spire, as in the Bengal species."

This is of much the same shape as K barrakporensis, the last

whorl is sharply keeled.

b. Height much exceeding diameter.

410. Kaliella aspirans, W & H Blanf (Helix) J A & B xxx, 1861, p 355, pl 1, fig 12, Pfr (Helix) Mon Hel x, 1868, p 81, H & T (Helix) C I 1870, pl 16, fig. 4, Nevill, Hand-l 1, 1878, p 41, Godwin-Austen, Mol Ind 1, 1882, p 6, pl 1, fig 12 (shell)

Shell subperforate (subobtectly perforate), pyramidal, elevately conical, thin, scaicely striated, smooth, not polished, translucent, brownish horny; spire high, conical, sides almost straight, apex obtuse, suture shallow, whorls 7, slightly convex, the last keeled, but not sharply; aperture nearly vertical, semicircularly lunate, peristome than, straight, columellar margin vertical, reflected, concealing the perforation

Diam 2, length 3 mm

Hab. Nilgiri Hills, Pykara
This is near K fastignata, but smaller, and higher in proportion
to the diameter

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411. Kaliella fastigiata, Hutton (Helix), J A S B. vii, 1838, p 217;

Pfr (Helix) Mon. Hel. 1, 1848, p 37; id t c 11i, 1853, p 40.

Bens (Helix) A M N H (3) 111, 1859, p 272, H & T (Helix)

C I. 1876, pl 16, fig 5, Nevil, Nanna (Microcystis), Hand-l 1, 1878, p 40, Theob J. A S B. 1881, 2, p 40, Godwin-Austen, Mol Ind i, 1882, pp 8, 21, pl 2, fig 8 (shell).

Shell imperforate (subperforate), high trochiform, thin, finely striated under the microscope, with impressed slightly oblique lines above, no concentric striation on base, pale brownish horny; spire pyramidal, sides very little convex, suture slightly impressed; whorls 7½, slightly convex, the last sharply carmate, flatly convex below; aperture nearly vertical, angulately lunate, peristome thin, margins nearly parallel, columellar vertical, triangularly reflected.

Duam. 3, height 4 mm.

Hab Western Himalayas; Simla (Hutton); Landour and Mussoorie above 5000' and beyond '7000' (Benson); Hazara (Theobald) Nevill adds Darpling, Dafia Hills, Naga Hills, and Arakan Hills,

but the three last are open to question.

The animal is described by Hutton as greyish. It is found on dead leaves at Simla, and when in motion carries its shell upright According to Benson, at Mussoorie and Landour it was procured creeping on the large wet leaves of Savifiaga ciliata, in damp and shady situations having a northern aspect.

412. Kaliella elongata, Godwin-Austen, Mol Ind 1, 1882, p 9, pl 2, fig 9 (shell).

Shell subperforate, very elongately pyramidal rather irregularly obliquely ribbed above, almost smooth beneath, pale horny brown; spire very high, sides convex, apex obtuse, suture impressed; whorls 9½, convex, the last carinate, flatly convex beneath; aperture slightly oblique, roundly lunate; peristome thin, outer margin sinuate, columellar vertical, rather broadly reflected

Diam. 3, height 5\frac{1}{2} mm.

Hab Rahang, Jyntea Hills

I have only seen one specimen of this shell, which is much more elongate than any other species of the genus.

*413. Kaliella colletti, Sykes, Jour Mal vn, 1899, p 30, pl 2, fig 1.

"Shell subperforate, elongately pyramidal, horny, smooth, apex yellow, rather acute, the base subimpressed in the umbilical region, whorls 8, flattened, the first rapidly, the remainder slowly increasing, beneath the lens obscurely striated transversely, suture impressed; aperture quadrate, right margin thin, columellar subreflexed'

"Diam. 2·1, height 3 85 mm" (Sykes, in Latin)

Hab Binoya (3600'), Ambagamuwa, Ceylon; on bamboo, orange,
and mango trees (Collett)

Sides of the spire strongly convex. The figure represents the mouth as nearly semicircular.

B. Turbinate, carinate.

[Mostly of doubtful affinity, anatomy not known.]

414. Kaliella gratiosa, Godinin-Austen, Mol Ind 1, 1882, p. 9, pl 2, fig. 10

Shell subobtectly perforate, turbinate, globosely conoid, finely, transversely, and obliquely ribbed above, minutely concentrically striated and radiately ribbed on the base, pale horny brown, spire conoid, apex blunt, suture well impressed, whorls 5½, convex, the last with a raised keel at the periphery, turnidly convex beneath; aperture slightly oblique (?), semicircularly lunate; peristome thin, columellar margin oblique, reflected at the perforation.

Diam 31, height 23 mm

Hab Kopamedza Peak, Angami Naga Hills, 8375' (Godwin-Austen)

It is very doubtful whether any one of the specimens examined is adult.

415 Kaliella animula, Godwin-Austen, Mol. Ind. 1, 1882, p 23, pl. 5, fig. 1

Shell imperforate, turbinate, no distinct ornamentation, but indistinctly and obliquely sculptured under the microscope, and subobsoletely, very minutely, longitudinally striated above and below, pale horny brown; spire conoid, sides convex, apex obtuse, suture impressed; whorls 5, convex, the last angulately keeled, tumidly convex beneath, aperture subvertical, large, subquadrately lunate, columellar margin reflected.

Diam 2½, height 2 mm.

Hab. Khası Hills (Godwin-Austen)

Neither of the two specimens is perfect, nor, so far as can be judged, adult.

416. Kaliella [?] vagata, E A Smith (Sitala), Faun Geog. Mald Lac.

Aich 1, pt 11, 1902, pp. 142, 145 [shell and radula figured by Godwin-Austen]

Shell minutely and subobtectly perforated, obtusely turbinate, thin, fuscous brown, decussated by oblique fine strim of growth and by minute spiral lines, above and below, spire moderately laised, apex obtuse, suture impressed; whorls 5, convex, regularly increasing, the last sharply angulate at the periphery, convex beneath, aperture oblique, lunate; peristome thin, columellar margin vertical, rather broadly reflexed, partly covering the umbilicus.

Major diam 3, min. 23, height 2½ mm

Hab Minicol Island, between the Laccadives and Maldives.

Probably introduced, like other shells of those islands, from the Malabar coast

The teeth of the radula number:

32 . 6 . 1 . 6 32 (38 . 1 . 38).

The admedian teeth, like the rhachidian, have a long median cusp and lateral cusps as in *K. banakporensis*, &c [The internal anatomy has not been seen, it therefore can only be placed in this genus with doubt.]

*417. Kaliella [2] kjellerupi, Morch (Namna), Jour Conchyl xx, 1872, p 310, Pfr (Helix) Mon Hel vin, 1877, p 72, Godwin-Austen (Sitala), P Z S 1895, p 442.

"Shell imperforate, turbinate, keeled, yellowish, smooth, spire conoid, apex obtuse, flattened, base convex, very smooth, suture very narrowly marginate; whorls 5, slightly convex, increasing slowly, nearly equal in size, the last not descending, strise of growth not prominent, irregular, aperture rhomboidally lunate, columellar margin thickened, subreflected.

"Diam maj. 6, axis nearly 4 mm." (Morch, in Latin)

Hab. Great Nicobar.

418. Kaliella teriaensis, Godwin-Austen, Mol Ind i, 1882, p 10, pl 2, fig. '12 (shell)

Shell subperforate, depressedly subtrochiform, almost smooth, with extremely fine oblique ribbing on upper whorls only seen under microscope, the base smooth, bleached, probably when fresh brownish; spire conical, sides straight, suture impressed; whorls 5, convex, the last sharply keeled, convex below, aperture nearly vertical, securiform, subquadrately lunate, peristome thin, columellar margin oblique.

Diam. 3.7, height 2 mm.

Hab. Term Ghat, at southern base of Khasi Hills (Godwin-Austen)

419. Kaliella nagaensis, Goduin-Austen, Mol. Ind. 1, 1882, p. 9, pl 2, fig 11 (shell).

Shell imperforate, trochiform, marked above with fine oblique ribbing only visible under the microscope, and with radiating lines on base, pale horny brown, spire conical, sides straight, suture impressed; whorls 6, convex, the last carinate, with a slightly raised keel, rather flat below, aperture slightly oblique, angulately lunate, peristome thin, the columnlar margin thickened and reflected, rounded below, briefly vertical above

Diam 3½, height 2½ mm.

Hab. Kopamedza Peak (8375') and Naga Hills [Dikrang Valley, Daffa Hills, and Barowli Gorge north of Tezpur (Godwin-Austen)]

The spire is considerably higher than in K. terraensis, and lower than in K. barrakporensis and its allies

[420 Kaliella paucistriata, Godunn-Austen, Mol. Ind ii, 1907, p. 174, pl 103, fig 10 (shell)

Locality. Dikrang Valley, Dafia Hills (Godwin-Austen)

Original description —Shell keeled, depressedly pyramidal, sculpture microspiral striation with coarse, irregular, distant, transverse costulation, the same shown on the basal side, colour very pale ochre; spire moderately high, sides flat, suture shallow Whorls 5, sides flatly convex, aperture not complete, probably quadrate; peristome thin; columella broken.

Size · maj. diam 3.8, alt axis 2 mm

The form of this shell is very like that of *K. nagaensis*, but has different sculpture]

[421. Kaliella richilaensis, Godwin-Austen, Mol Ind 11, 1907, p 175, pl 103, figs 2, 2 b.

Locality. Richila Peak, Bhutan frontier, 10,370 feet (W Robert)
Original description:—Shell globosely conoid, very rounded
below, very narrowly umbilicated; sculpture, transverse distant
costulation, rather fine, not regular, colour pale sienna-brown,
spire moderately high, sides flat, apex blunt, suture impressed,
whorls 5, keeled on the last, but with no carination, flatly convex,
aperture narrowly lunate, peristome thin, columellar margin
nearly perpendicular, reflected near the umbilicus.

Size: maj. diam. 3.3, alt. axis 1.8 mm.

Somewhat of the form of K nagacuss, it is, however, a smaller shell and the sculpture is not so fine and regular as in that species.]

[422. Kaliella richilaensis, var, Godwin-Austen, Mol Ind 11, 1907, p. 175, pl 103, fig 2 a

Locality Richila Peak, Bhutan frontier, 10,370 feet (W. Robert)
Original description —Shell globosely conoid, not umbilicated,
covered with a strong epidermis, sculpture very regular fine
costulation; colour strong sienna tint, spire moderately high,
conoid, apex rounded, suture shallow, whorls 5, rather flatly
convex; aperture narrowly lunate, peristome thin, columellar
margin subvertical, but very slightly reflected.

Size maj diam 36, alt axis 22 mm]

C. Turbinate or globosely conoid, not car mute

423. Kaliella? nana, Hutton (Helix), J A S B vii, 1838, p 218,

Pfr. (Helix) Mon Hel 1 1848, p 31, H & T (Helix) C I
1876, pl. 61, figs 7, 8, 9, Nevill, Nanna (Microcystis), Hand-l

i, 1878, p 38, Godwin-Austen, Mol Ind 1, 1882, p 21, pl. 5, fig 6 (shell), 11, 1898, p 47

Helix bullula, Pfr. (Helix) Mon Hel v, 1868, p 72, nec Hutton.

Shell obtectly perforate, globosely conoid, smooth, under the microscope finely obliquely ribbed above, and with radiating lines on base, pale horny brown; spire conoid, sides convex, apex obtuse, suture well impressed; whorls 5½, convex, closely wound, the last rounded at periphery and below, aperture nearly vertical, lunate; peristome simple, columellar margin oblique, reflected, concealing perforation.

Diam 2.3, height 2 mm.

Hab. N.W. Himalayas, Simia, Kulu, Mussoorie; Darjiling Nevill adds Moisraka, Midnapur district, Calcutta (Botanical Gardens), and Pt. Canning. [very doubtful if it is the same species]

Hutton notes that this form is common at Simla and that the colour of the animal is dark grey. Of the animal found in Calcutta, Stoliczka notes (quoted by Nevill) that it has a small

gland with a short horn above and no mantle-lobes.

The process on the columellar lip of the peristome which covers the perforation resembles that of Alice ocystena. It is best seen in very old shells.

424 Kaliella? bullula, Hutton (Helix), J A S B vii, 1838 p. 218, Pf; (Helix) Mon Hel 1, 1848, p 86, H & T (Helix) C I 1876, pl 61, igs 2, 3, Nevill, Nanna (Microcystis), Hand-l 1, 1878, p 37, Godwin-Austen, Mol Ind 1, 1882, p 23, pl 5, figs 4, 5 (shell).

Shell subperforate, turbinate, globosely conoid, smooth, under the microscope seen to be ornamented by fine oblique ribbing above and indistinct subobsolete concentric strix on base, pale horny; spire conoid, apex obtuse, suture impressed, whorls 5, convex, the last subangulate at periphery, descending slightly in front, convex beneath, aperture subvertical, broadly lunate; columellar margin oblique, slightly reflected.

Diam. 4, height 3 mm

Hab. Western Humalayas, Sımla. Kulu, Chor, Landour, Mussoorie, Kumaun

The type was obtained amongst dead leaves at Simla The shell described by Pfeiffer as this species (Mon Hel. iv, p. 86) was not bullula but nana.

425. Kaliella? resinula, Godwin-Austen, Mol Ind 1, 1882, p 22, pl 5, figs 7, 8 (shell).

Shell obtectly perforate, globosely conoid, very finely and closely transversely costulately striated, the sculpture microscopical and often obsolete, pale brownish horny; spire conoid, rather high,

sides strongly convex, apex obtuse, suture deep; whorls 6½, convex, the last larger, rounded at periphery, convex beneath; aperture semicircularly lunate, nearly vertical; peristome thin, columellar margin rather broadly reflected, covering perforation.

Diam 2 25, height 2 1 mm

Uab. Khasi Hills.

This is very near K. nana, but higher and with an additional whorl

*426. Kaliella? sikkimensis, Godioin-Austen (Nevill, MS), Mol Ind 1, 1888, p 22, pl 5, fig. 9 (shell), id t c 11, 1907, p 175, pl 103, fig 4 (shell)

This is another close ally of K nana and K resimila, and has nearly the same dimensions as the latter, it is even more globose, the sides of the spire more convex, and with the last whorl proportionately larger. I have not seen a specimen.

Hab Sikhim.

[Locality. Shell figured (pl 103) is from the Risett chu Valley,

South Sikhim (W. Robert).

Original description —Shell globosely conoid, scarcely perforate; sculpture very fine, close, regular, transverse struction, colour pale sienna-brown; spire conical, less than the major diameter, apex blunt, sides convex, suture moderately impressed; whorls 6, rather convex, closely wound; aperture narrowly lunate, vertical; peristome thin, columellar margin oblique and but slightly reflected.

Size maj diam 19, alt axis 1.6 mm.

This pretty little shell, of which the type described by me is in the Indian Museum, Calcutta, appears to be fairly numerous in the deep hot valleys of Sikhim]

427. Kaliella? lhotaensis, Godun-Austen, Mol Ind i, 1882, p 22, pl 5, fig. 2 (shell).

Shell imperforate, convexly conoid, depressedly subturbinate, with fine subcostulate transverse struction under the microscope, often obsolete, indiately structe beneath, pale brown, spire conoid, sides convex, apex obtuse, suture impressed, whorls 5½, convex, the last subangulate at periphery, rounded below; aperture oblique, roundly lunate; peristome thin, columellar margin vertical, reflected.

Diam. 22, height 17 mm. Hab Lhota Naga Hills

This is also allied to K nana, but has a much lower spire.

[428 Kaliella? shillongensis, Godwin-Austen, Mol Ind. 11, 1907, p 176, pl. 103, fig 5 (shell)

Locality Shillong, Khasi Hills (Godwin-Austen) Two specimens were found.

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Original description.—Shell globosely conoid, very narrowly umbilicated, rounded below, sculpture very fine, regular transverse ribbing; colour umber-brown, spire less than breadth, apex blunt; suture well impressed, whorls 5½, rather closely wound, sides convex; aperture lunate, suboblique, peristome thin, scarcely reflected, columellar margin suboblique.

Size: maj. diam. 2 1, alt axis 1 4 mm.

Compared with K. Ihotae sis, this shell is smaller and the whorls much more convex; with typical flatura, it is larger, but the whorls do not increase in the same way and in the same proportion; and the same may be said of the very similar shell from the Sikhim frontier, which differs in having a larger bodywhorl and larger aperture, they all, in fact, merge into one another]

429. Kaliella? flatura, Godwin-Austen, Mol Ind i, 1882, p 23, pl 5, fig 10 (shell).

Shell perforate, convexly conoid, subturbinate, very finely costulately striated under the microscope, the sculpture generally obsolete, below marked with curved radiating striæ, horny brown; spire conoid, sides convex, apex obtuse, suture impressed, whorls 5, convex, last broader, rounded at periphery and below, aperture semicircularly ovate, subvertical, peristome thin, columellar margin vertical and reflected

Dam. 2, height 15 mm

Hab. Manipur.

This has a deeper suture and a broader last whorl than the species of the K. nana section generally

[430. Kaliella? flatura, var, Godwin-Austen, Mol. Ind. 11, 1907, p. 176, pl 103, fig 3 (shell)
Kaliella flatura, Godwin-Austen, Mol. Ind 1, 1882, p 23, pl 5, fig 10

Locality. Richila Penk, 10,370 feet, on Darjiling-Bhutan

frontier (W. Robert), also Bisett chu Valley and Damsang

Original description.—Shell globosely conoid, umbilicated; sculpture very minute, transverse ribbing, only visible under high power, smooth to eye and not so regular on the last whorl as it is on the rest of the whorls; colour pale ochre; spire, sides slightly convex, apex rounded, suture well impressed; whorls 5, very convex; aperture semilurate; peristome thin, columellar margin suboblique and slightly reflected.

Size maj. diam. 225, alt axis 1.30 mm.

It is interesting to find this minute shell in the Eastern Himalaya, so extremely close in form to that I found in Munipur, the sculpture on the last whorl not being so regular as in the type; it is similar above?

D. Lenticular, sharply keeled, decussated.

431. Kaliella? burrailensis, Godioin-Austen, Mol Ind. 1, 1883, p. 70, pl 15, figs 5, 5 a, 5 b (shell)

Shell minutely perforate, lenticular, thin, transversely obliquely ribbed and decussated by rather irregular striation above, below radiately and more strongly but very irregularly concentrically ribbed, pale horny; spire low, conoidal, sides convex, suture very shallow, apex slightly prominent; whorls 5½, flat above, the last keeled, convex beneath, not so prominent as the spire; aperture subvertical, angulately lunate, narrow; peristome thin. columellar margin oblique.

Diam. 5, whole height 2.6 mm Hab. Burrail Range, Naga Hills

Distinguished by minute perforation from the umbilicate K. kezamahensis and lailangkotensis, also by sculpture and other characters.

432. Kaliella ² ruga, Godwin-Austen, Mol. Ind. 1, 1883, p 70, pl 15, fig 4 (shell).

Shell perforate, sublenticular, transversely ribbed and decussated by impressed lines above and below, pale horny; spire low, conoid, suture impressed, whorls 5, convex, the last sharply angulate, turnid below, more swollen than the spire is above the keel; a small pitted mark behind the lower margin of peristome, showing inside the aperture as a minute plant, not always conspicuous, as in Sesara helicifera; aperture subvertical, angularly lunate; peristome thin, columellar margin very oblique

Dmm 3, height 2 mm.

Hab. Phúnggám, Lahúpa Naga Hills, and Shiroifurar Peak, N.E. Munipur, 9000 ft.

E Shell conoidal, carinate, with a long narrow aperture

[433. Kaliella? dikrangensis, Godwin-Austen, Mol Ind 1, 1883, p 72, pl 16, fig 3 (shell).

Original description —Shell globosely conoid, keeled, imperforate, much rounded below; sculpture very microscopic, transverse regular costulation, the finest I have seen; colour pale amber; spire pyramidal, sides nearly flat, apex well rounded, suture moderately impressed; whoris 6, closely wound, aperture narrowly quadrate; columellar margin strong, perpendicular, with a slight protuberance on the inner margin.

Major diam. 1-6, height 1 1 mm

Hab. Dikrang Valley, Dasia Hills (Godwin-Austen)

This shell, of which I only possess one example, is similar in form and comes nearest to K. nongsteinensis (Jainta Hills), but

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is very much smaller, the spire less conoid, and much more rounded below. The sculpture is similar to that of Kahella

Nothing is known of the anatomy of these very minute species.]

434. Kaliella? nongsteinensis, Godwin-Austen, Mol. Ind i, 1883, p 72, pl 16, hg. 2 (shell)

Shell imperforate, conoid, subtrochiform, under a powerful microscope costulately striate, pale brownish; spire conoidal, rather high, sides convex, apex obtuse, suture shallow, whorls 8, closely wound, slightly convex, the last carinate, projecting in the middle around the umbilical region, rather flat outside near the keel; aperture narrow, rectangular, oblique to the axis of the shell; peristome ——?

Diam. 2, height 1.7 mm.

Hab. Maotherichan Peak, N. Khasi.

[435. Kaliella bhutanensis, Godwin-Austen, Mol Ind. 11, 1907, p 196, pl. 103, fig 7 (shell).

Locality. Damsang, Daling District, Western Bhutan Hills.

Original description —Shell conical, perforate, flatly rounded on base, keeled; sculpture microscopic, transverse, irregular lines of growth, these are well shown on the basal side; colour pale dull ochreous; spire high, with convex sides, apex blunt; suture very shallow; whorls 8, closely wound, flat-sided; aperture narrowly quadrate; peristome thin, columellar margin short, nearly vertical.

Size maj. diam 223, alt. axis 16 mm

Its nearest ally is K. nongsteinensis, of the North-western Khasi Hills; but it is broader on the keel in proportion to height of spire and much flatter on the base]

436 Kaliella 2 tirutana, Godwin-Austen, Mol. Ind 1, 1883, p 72, pl. 16, figs 4, 5 (shell).

Shell imperforate, conoidal, with the area below the carnation prominent, smooth, whitish horny (? bleached), spire conoidal, sides slightly convex, apex obtuse, suture shallow; whorls 6, convex, closely wound, narrow, the last keeled, flattened, but inclined below keel, and projecting considerably in the umbilical region; aperture narrow across, but long, almost rectangular, and elongate in a line oblique to the axis; peristome with columellar margin straight, oblique, and reflected.

Diam. 12, height 12 mm.

This resembles nongeteness, but is smaller, and has fewer whorls and a less convex spire. It has the same rectangular mouth inclined to the axis of the shell.

437 Kaliella ² chennelli, Godwin-Austen, Mol. Ind 1, 1883, p 73, pl 16, fig. 1 (shell)

Shell imperforate, depressedly conoid, lenticular, finely transversely striated above, below radiately striated with traces of concentric lines, pale horny brown; spire conoid, sides flat, suture shallow, whorls 6½, closely wound, almost flat above, the last carinate, convex below, lower surface not so prominent as the spire, aperture vertical, narrow, subquadrangular, peristome thin, columellar margin slightly oblique, reflected

Diam. 3}, height 2 mm. Hab. Lhota Naga Hills.

This is distinguished by its numerous whorls and narrow elongate aperture. It is said to be finely hairy when fresh

F. All the whorls carmate in middle, last whorl becarinate.

438. Kaliella? conulus, W T Blanford (Nanna), J A S B 1865, 2, p 78, Pf. (Helix) Mon. Hel v, 1868, p 89, H & T. (Helix) C. I 1876, p 129, figs 5, 6, Nevill, Nanna (Microcystis), Handli, 1878, p 41, Godwin-Austen, Mol Ind 1, 1883, p. 71, pl. 15, figs 6, 6 a (shell).

Shell imperforate (subperforate), turreted, thin, translucent, marked with oblique, sinuous, subfiliform, costulate striation, and on the base with radiating strim and very fine spiral lines, white horny; spire conical, apex rather obtuse, suture deep; whorls 6, very convex, keeled in the middle, the keel very fine, raised, thread-like, and white; the last whorl bicarinate, the second spiral keel being below the periphery, flatly convex beneath, aperture oblique, rhomboidally lunate, about equally broad and high, peristome thin, columellar margin nearly vertical, very briefly reflexed at the penultimate whorl

Diam 12, height 2 mm

Hab. Phoung-do, near Taungup, Arakan (W T. Blanford), Jatunga Valley, North Cachar Hills, and Manipur (Godwin-Austen).

This form stands alone, no near ally having been found. It may have relations to the Andaman Sitala? homfrays and S subbilis ata, now referred to Philalanka.

439. Kaliella peliosanthi, Morch, Helix (Kaliella), Vidensk Medd

"Shell very minute, trochiform, obtectly perforate, whorls 41, angulate in the middle, spirally lineate, lines of growth prominent, at regular distances, the last whorl bicarinate, flat and smooth at the base, the umbilicus narrow and oblique, epidermis very thin, hairy on the keels; aperture rhombic, columellar margin subdentate

"Diam. 1 10, height 1 mm." (Morch, in Latin)

Hab. Culcutta.

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Found on leaves of Pcliosanthes teta from the Harbour of Said to be somewhat similar to K conulus, but much Calcutta smaller.

II Umbilicated

- *440. Kaliella 2 few, Tap Canefit, Ann Mus Civ Gen Lavii, 1889, p 321, pl 8, figs 7, 8
- "Shell deeply umbilicated, conical, trochiform, pale horny, spire conical, apex obtuse, whorls about 7, subconvex, ornamented with minute oblique regular stries, divided by impressed sutures, the last not descending in front, obtusely carrante at periphery, convex beneath; aperture roundly lunate, obscurely subquadrate, peristome simple, slightly expanded below, margins remote, columellar reflected below umbilicus

"Major diam. 9, min 81, height 8 mm" (Tap Can., in

Latin)

Hab Mount Mouleyst, Burma, East of Molmesn (Fea).

- *411 Kahella delectabilis, Sykes, Proc Mal Soc m, 1898, p 70, pl 5, fig 7, Godwn-Austen, Mol Ind n, 1883, pl 93, fig 4 (sculpture only)
- "Shell ovately conoid, narrowly but perspectively umbilier ed, horny, smooth, whorls 6, conver, under the lens microscopically striated transversely (longitudinally), the last carinate at the periphery, inflated beneath . apex smooth, suture impressed; aperture semilunate, columellar margin of peristome reflected

"Diam. 28, height 3 mm." Hab. Ambagamuwa, Ceylon (Collett).

- *442 Kaliella leithiana, Godwin-Austen, Mol Ind 1, 1883, p 71, pl 16, figs 6, 6 a, 6 b, Sykes, Proc Mal Soc 111, 1898, p 71 Plectopylis eugenii, Jones, Mém Soc Zool Fiance, vii, 1894,
- "Shell narrowly umbilicated, discoid, keeled, base flat; sculpture covered with an olivaceous epidermis, irregular transverse lines of growth; spire very depressedly conoid, sides flat, apex blunt; whorls 62, all very equal in breadth, flat, aperture elongate, narrow, perpendicular; peristome tlun, columellar margin upright,

"Major diam. 7, alt. axis 24 mm" (Godwin-Austen.) (Height 27 mm from figure)

Hab Ceylon.

The shell is represented in the figure as lenticular with a prominent keel, and may at once be recognized by its very narrow angulate mouth As the specimen was purchased from the late Dr. Leith's collection and the locality depended on his having marked the same on a card, the habitat may not be quite certain, for it is not probable that Dr Leith himself collected in Ceylon, and the shell does not resemble other Ceylonese or S Indian forms.

443 Kaliella? kezamahensis, Godwin-Austen, Mol. Ind. 1, 1883, p. 69, pl. 15, figs. 3, 8 a (shell), p. 146, pl. 40, fig. 10 (radula and spermatophore).

Shell narrowly umbilicate, depressedly trochiform, decussated above by oblique and spiral ribbing, below by radiating and concentric, the transverse (oblique or radiating) close, the spiral more distant, pale horny, spire conoid, apex obtuse, suture slightly impressed; whorls 5, flatly convex above, the last sharply keeled, almost flat beneath; aperture slightly oblique, subtrapezoidal, angulately lunate; peristome thin, curved back on right margin, columellar margin very oblique, scarcely reflected.

Diam. 425, height 25 mm.

Hab. Kezamah, Anghami Naga Hills; Gaziphima, Naga Hills

(Godwin-Austen).

The lingual 11bbon which has been extracted from a dried individual /closely resembles that of K lailangkotensis. The formula is 25.6 1.6.25 (31.1.31); rhachidian and admedians tricuspid; laterals bicuspid, with the outer cusp far back, not near the terminal one. The laterals differ from those of K bar-rakporensis.

444. Kaliella? lailangkotensis, Godwin-Austen, Mol Ind 1, 1883, p 68, pl 15, fig 1 (shell), pl 20, figs 2, 2 a (jaw and radula)

Shell narrowly and deeply umbilicated, sublenticular, decussated with transverse and longitudinal ribbing above and below, the concentric (longitudinal) sculpture disappearing near the umbilicus, pale brownish, spire low, conoidal, sides convex, suture impressed; whorks 5, convex, the last angulate at periphery, convex below, aperture slightly oblique, angulately lunate; peristome thin, columellar margin oblique.

Diam 43, height 23 mm.

Hab Lailangkote, Khasi Hills, common, also at Mairang, Teria

Ghat, Maotherichan Peak, and Mokarsa

The lingual ribbon is very similar to that of K. kezamahensis, and the formula is 26.2 5.1.5 2.26 (33 1 33) The lower surface is much more turned than in that species, mouth bronder, &c

III Subtuibinate, whorls rapidly incieasing

445 Kaliella? nevilli, Godwin-Austen, Mol Ind 1, 1883, p 70, pl 13, fig. 6

Shell umbilicated, depressedly conoid, subturbinate, thin, rugately subcostulate transversely, radiately structed below, periphery furnished with hairs, pale brownish horny, spire conoid, apex

prominent, suture impressed; whorls 4\(\frac{1}{4}\), convex, the last slightly angulate at periphery, rather turned below, aperture oblique, roundly lunate, peristome thin, columellar margin vertical, slightly reflected above.

Major diam. 7, min 6, height 3½ mm

Hab. Darnhng.

The relations of this shell are very doubtful. It cannot be a Kaliella to judge by the shell.

「Genus SARAMA *.

Type, S kala

Range. Hill-ranges south of Sikhim.

The animal of the type species, and the only one of the genus as yet known, is remarkable for its very dark coloration. The shell-lobes are as in *Macrochlamys*, the right narrow and tongue-like The type differs from *Macrochlamys* in the three following important characters —

1. The absence of the amatorial organ; 2. The absence of the coiled cocum near the retractor muscle of the penis; 3. Form of the spermatophore, which is short and with spines on the side of the capsule. To these may be added the form of the jaw, which is very straight on the cutting-edge.

446 Sarama kala, Godioin-Austen (Macrochlamys), Mol Ind 1, 1883, p 108, pl 40, figs 1-9 (shell and anatomy), 11, p 135 (spermatophore)
[Vide fig 83, p 276]

Shell minutely perforate, conoidly depressed, thin, translucent, polished, with very fine, close, longitudinal (spiral) striction throughout under the microscope, pale greyish horny, spire low, conoidal; the sides straight, suture slightly impressed, whorls 5, slightly convex, the last rounded at the periphery and below, aperture nearly vertical, lunate, peristome very thin, columellar margin subvertical above, rather broadly triangularly reflected.

Major diam. 8-5, min. 7, height 4 min

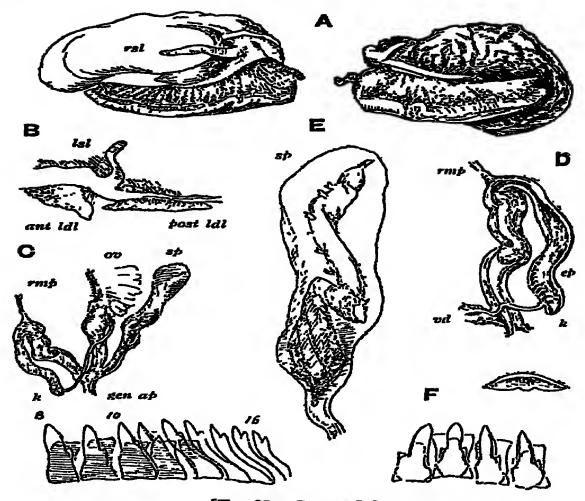
Hab Damsang Peak, Daling Hills, Western Bhutan (W

Robert)

Animal very dark-coloured above; pedal margin and sole pale No dart-sac and no cocum to the penis, the retractor muscle being attached directly to head of penis and epiphallus Teeth on radula 40 2.8.1.8.2 40 (50.1.50) · median tooth tricuspid, inner laterals with a single basal cusp on the outer side, outer laterals bicuspid [The jaw is abnormal, being very straight on the cutting-edge]

Not one of the specimens examined appears completely adult This species may be found in Sikhim and the mountains of Bhutan

* [Sanskrit "the dawn", "Hermes" in Greek]
† [The spire is higher than it is represented in plate 40 of the 'Mollusca of India' [This, the type, was outlined with the aid of camera lucida The height of spire is a very variable character in many of these species]



[Fig 83 — Sarama kala

Animal, spirit-specimen, views of right and left sides, shell removed

B Edge of mentle, left shell-lobe, and left dorsal lobes ×7
C. Generative organs ×4
The penis, with a spermatophore forming in the emphalius
E The spermatheca, containing a perfect spermatophore × 12

F Jaw and teeth of the radula × 340]

Genus SARIKA

Orobia resplendens, Albers, Die Heliceen, 1860, p 58 Nanna (Macrochlamys), & Nevill, Hand-l 1, 1878, p 20 Sarika, Godioin-Austen, Mol Ind 11, 1907, p 179

Type, S resplendens, Phil Range Tenasserim to Siam

Original description -Shell depressed, flat on base, smooth, shining, whorls very closely wound and regularly increasing

Animal with right and left mantle-lobes as in Macrochlamys. Generative organs differ, the retractor muscle of the penis is very large and given off directly at the head of that organ, no coiled cecum, amatorial organ long, with a rounded terminal knob. Spermatophore spineless.

SARIKA 277

447. Sarika resplendens, Phil (Helix) Zeitschr f Malah 1846, p 192, Ifi (Helix) in Mart & Chemn Conch-Cab ed 2, no 688, pl 110, figs 7-9, id (Hellx) Mon Hel i, 1848, p 56, H & T (Helix) C I 1876, pl 51, fig 4, Nevill, Nanina (Macrochlamys), Hand-l. 1, 1878, p 20, pt, Godwin-Austen, Mol Ind 1, 1883, pp 109, 110, pl 26, figs 1-3 (shells), id t c 1, 1898, p 49, [1, 1907, p 179, pl 111, figs 3, 3 a (genitalia), pl 116, figs 2-2 b (shell and dorsal lobes and radula)], v Mart Jour Linn Soc. xx1, 1889, p 162

Helix subcornea, apud Hanley, C I 1876, pl 149, figs 2, 3 nec Pfr.

Shell perforate, depressed, smooth, polished throughout, thin, pale, yellowish tawny, without longitudinal sculpture; spire very low, suture well impressed, whorls 7, convex, regularly increasing, the last rounded at the periphery and convex, slightly flattened beneath, deeply impressed in the middle, aperture nearly vertical,

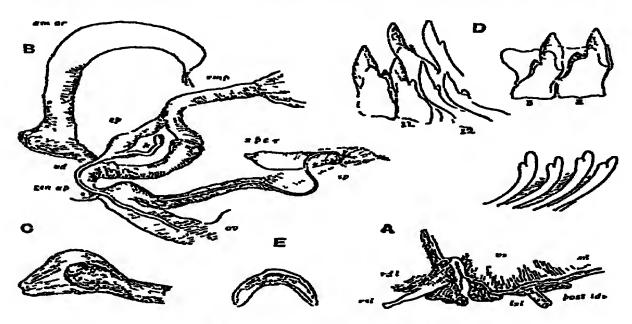


Fig 84 — Sarıka resplendens

A. Mantle-edge detached from the animal, shell- and dorsal lobes

B. The genitalia

O Anterior end of the amatorial organ
D Teeth of the radula

E Jaw]

broadly lunate, peristome thin, almost straight, basal margin faintly arcuate, columellar oblique, briefly reflected above

Major diam $25\frac{1}{2}$, min $23\frac{1}{2}$, height 12 mm.

Hab Mergui, Tenasserim; Mergui Archipelago; also Siam and Cambodia_

In the animal both shell-lobes are well developed, as in Macrochlamys undica. Neck-lobes small There is a long flagellum-like

kalc-sac, a long spermatheca, and a large dart-sac or amatorial organ. The formula for the radula is: 42.2.10.1.10.2.42

(54.1.54). [The jaw has no central projection]

[External characters, such as the shell-lobes present, led me in 1898 (Mol. Ind) to place this species in Macrochlamys, but it differs in many respects from the typical Indian species of that genus. Further material received since has shown the internal

anatomy to be very different.

The penis-sheath cularges upwards from the generative aperture to the broad, rather flat, and long retractor muscle. The epiphallus is long, and where it is joined by the vas deferens a kalk-sac nearly as long is given off. Within the length of the epiphallus in this specimen a spermatophore was in an advanced stage of development, the sac of which is indicated by the swelling close to the vas deferens. The spermatheca is very long, a narrow tube swelling into an elongate, pear-shaped, thin-walled sac. This contained a single perfectly formed spermatophore. The amatorial organ is very large and thickened, the free end terminating in a very blunt globose knob. The rest of the generative organs do not call for any special mention.

The spermatophore differs in detail from any I have yet been fortunate to come across (vide spermatheca, fig 84, B), the flume is very long, quite free of spines on the side, 2 or 3 large ones only at the base of the capsule, which is elongately oval, with very transparent sides and with the usual cap-like terminal end. It is thus on the mould of spermatophores of species of the genera Girama and Austenia &c., but shows very interesting variation in minor detail, supporting the conclusion I have arrived at, that this species resplendens cannot be retained in Macrochlamys, but

forms a good and distinct genus.

The animals of resplendens and of the Siamese species S. pumicata, Morelet, are much nearer that of Xesta type citima, but the conchological differences are very great. The closely-wound depressed shell of resplendens and its allies presents characters which cannot be overlooked, and they help considerably in separating this group of the Zonitides from Macrochlamys on one hand and Xesta on the other?

Hanley's figure (C I. pl. 51, fig 4) agrees fairly with Pfeisfer's and would appear to be some other species. Reeve's figure (Conch Ic no 430) is something different. Many different shells are found in various collections under this name. The description above is from a Mergin specimen in Col. Godwin-

Austen's Collection.

448 Sarıka burmana, Pfr (Helix) P Z S 1857, p. 107, id. Mon Hel iv, 1859, p 42, H & T (Helix) C. I 1876, p vii Helix aceria, Bs. A. M N H (8) iii, 1859, p 389, Pfi Mon Hel v, 1868, p 100, H. & T C I 1876, pl 51, fig 2; v Mart (Macrochlamys) Jour Linn. Soc xxi, 1889, p 162, Kobell (Macrochlamys), Mart & Chemn. Syst Conch-Cab ed 2, 1901, Naminda, p. 1020, pl 263, fig. 1 Shell perforate, depressed, rather solid, without sculpture, white, with a brownish-yellow band above the periphery and inside the suture; spire low, conoid, suture scarcely impressed, whorls 7, slightly convex, slowly increasing, the last rounded at the periphery and convex beneath; aperture oblique, broadly lunate; peristome blunt, slightly thickened, columellar margin oblique and slightly curved throughout, reflected above

Major diam. 25, min. 23, height 12 mm.

Hab. Mergui, Burma; Mergui Archipelago (Anderson)

Hauley has united burmana and acerra The spiral band of the former has not been observed in the latter, which is slightly larger and more depressed 28×25×11 mm.

Genus TAPHROSPIRA.

Taphrospira, W. T Blf P Z S 1905, p 441, [Godwin-Austen, Mol Ind n, p 177, pl 111, figs. 1-1f (animal and anatomy)]

Type, T. convallata, Bs. .

Range. Assam Hills, Burma, Tenasserim, and the Andaman Islands.

Shell depressed, thin, horny, resembling Mac ochlamys, but with a deep gloove just outside the suture throughout the whorls.

Anatomy not known.

[For a long time the position shells of this form should fill has been one of considerable doubt; it was placed provisionally in Macrochlamys. Taphi ospira proves to be a very distinct genus, not only by shell-character, on which Dr. W. T. Blanford founded it, but also still more conclusively on the character of the animal. It is like Macrochlamys only as regards the right shell-lose; the ample left shell-lobe resembles that of species of Austenia The absence of the amatorial organ is the strongest point which differentiates it both from Macrochlamys and Austenia The penis is more like Austenia than typical Macrochlamys, so also is the spermatophore]

1.449 Taphrospira convallata, Bs (Helix) A M N. H (2) vui, 1856, p 250, Pf: (Helix) Mon Hel iv, 1859, p 46; H & T (Helix) C I 1876, pl 88, figs 2, 3, Nevill (Namna), Hand-l i, 1878, p 28, v Mart Jour Linn Soc xxi, 1889, p 162.

Shell minutely perforate, subglobosely depressed, thin, smooth, greyish horny; spire depressedly conoid, suture deeply but not broadly canaliculate, whorls 6-7, closely wound, all except the innermost sharply angulate above near the suture, the last rounded, not descending, convex below; aperture scarcely oblique, lunate, angulate above and with an indentation corresponding to the sutural canal, peristome thin, slightly alcuate externally and basally, columellar margin oblique, slightly expanded throughout, more broadly above

Major diam 141, min 13, height 8 mm

Hab Tenasserim Valley, Therapon Hill (Theobald), Mergui Archipelago (Anderson) Nevill adds Pegu, but evidently in error. Animal not known No fresh specimen is available, and it is uncertain whether microscopic striation occurs. A large shell measures 16, 141, and 81 mm.

450. Taphrospira compluvialis, Blf. (Nanna) J A S B 1865, 2, p 66, Pf. (Helix) Mon. Hel v, 1868, p 103, Blf. P Z S 1904, ii, p. 442, pl 25, fig 4

Shell perforate, subglobosely depressed, thin, pale horny, translucent, with very fine, close, microscopic, longitudinal striation above and below, spile very low, suture deeply and broadly canaliculate, whorls 41, sharply angulate above at edge of sutural groove, the last descending somewhat towards the mouth, rounded at the periphery and couvex beneath; aperture oblique, roundly lunate, about as high as broad, angular and emarginate above at the suture; peristome thin, scarcely sinuate, columellar margin-much curved, expanded, vertical, and more broadly reflected above.

Major diam. 10, min. 9, height 61 mm

Hab Arakan Hills, west side

Distinguished from T. convallata by fewer whorls, much broader sutural channel, more oblique and rounder aperture, &c. The animal is very dark in colour, and resembles Macrochlamys generally, but its anatomy has not been examined

451. Taphrospira excavata, Blf P Z & 1904, 11, p 441, pl 25, fig. 3. Helix compluvialis, II & T C I 1876, pl 88, fig. 1, 4, Nevill (Nanna), Hand-l 1, 1878, p 27, pt nec Nanna compluvialis, Blf 1865

Shell similar to that of *T. complicialis*, but larger and more globose, the microscopic longitudinal strike on the whorls are farther apart and shallower. The aperture is large and round and the columellar margin only expanded at the perforation, the mouth is less oblique than in *T complicialis* and there is little or no descent of the last whorl. Whorls 5

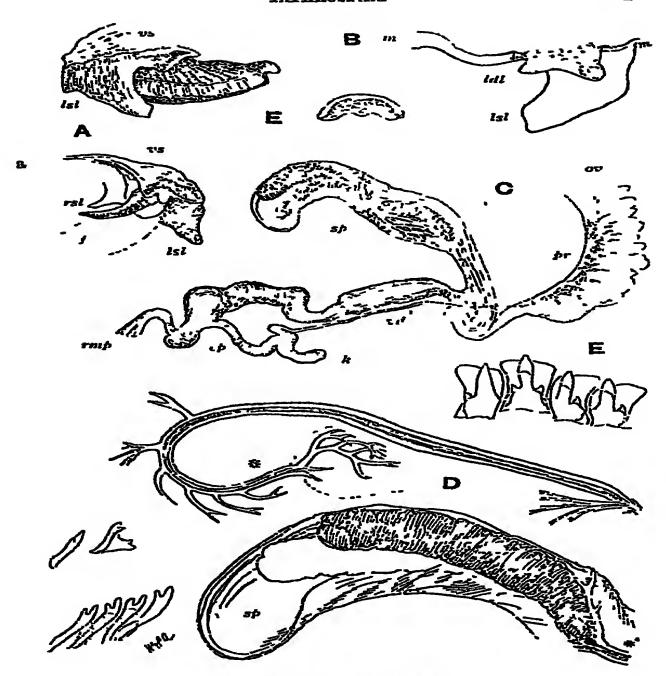
Major diam 15, mm 13, height 9 mm

Hab. North Cachar, Asalu (Godwin-Austen), also Khási Hills
and Assam (Nevill)

452 Taphrospira bathycharax, Bs MS; Theob. Cat p 17 (no description), Goduin-Austen, A M N H (6) n, 1888, p 56, id P Z S 1895, p 441, Fullon, Jour Mal \, p 99 (1903)

Macrochlamys subconvallata, Fullon, l c

Resembles T compliantales, but is much more depressed. Shell perforate, depressed, thun, brownish horny, polished, very finely and closely longitudinally structed above and below, spine very low, suture broadly canaliculate, who is 5-5½, the last not



[Fig 85.—Taphrospira bathycharax

- A. Animal, spirit-specimen, viewed from right and left sides, showing the large left shell-lobe, the latter turned down, exposing the under surface × 36
- B The mantle-edge, with the left dorsal lobe, viewed from beneath × 6.4
- C Genitalia, the spermatheca containing spermatophores. × 6 4
- D Spermatophores ×19.2 E Jaw and teeth of the radula × 368]

descending, aperture much lower than in T compluvialis, columellar margin of peristome oblique.

Major diam. 11, min. 10, height 5 mm.

Hab. South Andaman, Port Blair.

[The animal of Zaphrospina bathycharax, Bs. MS., a close ally of T. convallata, Bs, from the South Andaman Island, is as follows:—

Animal ochraceous, dark giey on the extremity of foot; mucous gland overhung by a pointed termination. Sole of foot divided;

usual peripodial grooves with a broad margin below.

The right shell-lobe is long and fairly broad at base, and in life probably very extensible over the shell. The left shell-lobe is very broad and smooth and must spread over a large surface of the shell. The dorsal lobes are all small, the left in two parts, the posterior situated under the left shell-lobe and distant from the anterior lobe. The wall of the branchial chamber is sparsely spotted. The animal examined was in an excellent state of preserviction, the generative organs at their full maturity. The most notable thing is the absence of the amaterial organ. The penis is elongate, there is a short kale-sac contiguous to the junction of the vas deferens, followed by a moderately long epiphallus, up to the penis muscle retractor, there is no cæcum, the tube bends on itself and soon expands into a convoluted mass with an indistinct coiled appearance when looked at with transmitted light, thence it becomes much narrower and leads away towards the generative aperture. The above swollen aperture looks as if we had here the representative of the coiled excum of Macrochlamys much modified and separated from the retractor muscle. spermatheca is elongate, and contains three spermatophores beautifully preserved; the walls of the sac were of necessity much stretched and transparent. The uterus and ovo-testis do not call for any attention.

The spermatophore recalls that of Austenia grass. The flume is very long with a bunch of fine bifid delicate spines at its basal end; for about two-thirds of its length it is straight-edged and spineless, six spines then occur at very equal distances apailt, up to the junction of the flume and capsule, which is long and cylindrical, terminating in a thin whip-like appendage, but the cap-like end of the capsule seen in other species is not present in this one. The most striking feature of this spermatophore is the large single anticr-like process at the terminal end of the flume, having six points, and these again bifid, very similar in this

respect to A. gigas.

Jaw semicircular, with a central projection.

The radula formula is

Central tooth tricuspid, admedians bicuspid, of usual form in Macrochlamys]

[Subfamily SOPHININÆ.

The single genus Sophina

The form of the shell with its more or less developed umbilical keel, together with the very different type of radula, distinguishes

it from the preceding subfamilies

The animal possesses ample broad right and left shell-lobes, also a very large and entire left dorsal lobe. The radula presents teeth of similar shape throughout the row, pyramidal in shape, sharply pointed, springing from an obtusely rounded basal plate. There are 80-100 teeth in the row]

Genus SOPHINA.

Soplina, Benson, A M N H (3) ii, 1859, p 473, ul t . (3) v, 1860, p 26; ul t c (3) x1, 1863, p 323; Stoliczka, J A S B 1871, 2, p 252, [Godwn-Austen, Mol Ind ii, 1907, p 221, pl 115, figs 5, 5 a (animal), pl. 116, fig 3 (auatomy)]

Type, S. calras, Bs.

Range. Tenasserim Provinces

Shell umbilicated, depressed or globosely depressed, thin, horny, generally resembling Macochlamys except that the columella is

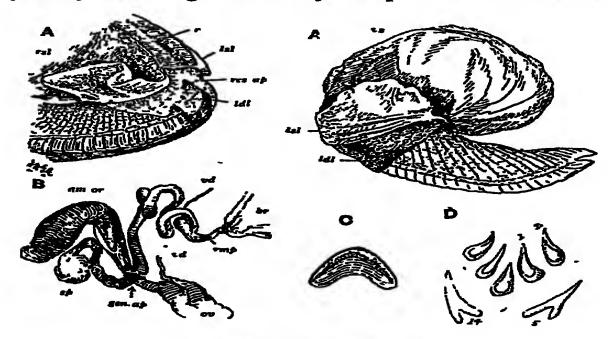


Fig 86 — Sophina schistostelis

A. Animal viewed from the right and left sides, shell removed to show shell- and dorsal lobes

- B Genitalia. × 14
 O Jaw, enlarged (after Stoliczka)
- D Teeth of radula (ditto), 5th and 14th, lateral view of.]

thickened, forming a sharp angle with the basal margin of the peristome, and with a notch at the angle from which a keel runs round the umbilicus

The animal (taken from Stoliczka's description of S calias, ? S. schistostelis) is fully retractile within the shell. The foot is elongate, very narrow, with a distinct peripodial groove, the posterior end obliquely truncate, occupied by a large high gland, above which is a distinct horn-like appendage. The sole has two longitudinal grooves dividing it into three subequal parts, the middle rather narrower than the other two Eye-pedicels about half the length of the body: tentacles about one-fourth the

length of the eye-pedicels.

Mantle conspicuously thickened near the margin. The left shell-lobe is very large, entire, reflected over the edge of the outer lips of the shell and below considerably produced. The right lobe is divided into two parts, the upper is linguate, narrowly produced and covering the base of the shell, partially also extending on to the upper surface of the penultimate whork, as in Macrochlamys; the lower portion is shorter, somewhat folded and reflected over the columellar lip. The dorsal lobes are well developed and entire. Genital opening at the upper somewhat outer base of the right eye-pedicel.

The general anatomical structure offers nothing very peculiar The kidney is an elongate, rather granular than plicated gland, placed at the side of the heart; it possesses a special long duct accompanying the rectus and terminating a little short of the

anus.

Stoliczka thus describes the genitalia —

"The genital organs chiefly occupy the anterior part of the body. The arrow-sac is short and thick, with an enclosed, thick, pointed papilla The uterus, accompanied by the prostata, is very long, thick, the former has a yellowish colour with a greenish tinge, the latter is purely white, terminal albuminous gland of moderate size, slightly thickened, hermaphiodite gland large, rather flatly depressed, connected with the uterus by a long twisted duct. The vas deferens branches off a short distance from the hermaphrodite opening in about three-fifths of its length from its origin it has a long pointed appendage, consisting of strong tassue, filled with minute, elliptical, calcareous secretions; this appendage is attached by a special muscle close to the place of attachment of the arrow-sac, the last two-fifths of the vas deferens gradually widens and towards the end the simple tube consists internally of remarkably soft muscular tissue, but there is no papilla present The receptaculum seminis is a globulai gland, attached to a long slightly twisted string, originating from the oviduct quite close to the hermaphrodite opening"

It is apparent from this description and the figure that accompanies it that these organs were not at their full state of development, and were long and string-like in appearance. Those dissected lately by me were in a much more advanced stage (see

SOPHINA. 285

fig. 87). The spermatheca is globular at the free end, but on a strong thick base. The vas deferens is given off from a bulbous expansion of the penis-tube close below the junction of the thick strong retractor muscle. The shaft of the male organ to the generative aperture is peculiarly long. The amatorial organ is short and thick with well-developed pointed papilla.

"The jaw of calius is broadly semilunar, thin, apparently smooth, but when moderately enlarged and viewed in transparent light a distinct concentric struction is perceptible, and there are some very

minute radiating lines to be observed near the middle part

"The radula is elongately quadrangular, consisting of about 35 to 50 transverse lows of teeth, meeting at shalp angles in the middle line, there are about 80-100 teeth in each row. They are all of a similar shape, pyramidal, sharply pointed and attenuated in the front, gradually becoming wider and terminating with an obtusely lounded base. The middle tooth is slightly contracted below the middle, it is symmetrical, the laterals are gradually more bent outwards on either side and possess on the outer side near the point a lounded and angular projection; the angle appears to be directed posteriorly; the outermost teeth are quite simple. The teeth of S discordalis and conjungens are exactly similar to those of calias, only comparatively smaller." (Stoliczka.)

The genus Sophina is perhaps the most interesting in the family Zonitide, it is the most aberrant of all I have examined. It presents departure from the ordinary type, particularly from those which the torm of the shell recalls. The most striking character is the radula; there is nothing approaching the peculiar simple form of the teeth in any known genus of the family. Next, the large, broad, left dorsal lobe, entire for its whole length, without a trace of a slit. This character is that of an old Peninsular India group met with in Ariophania (Nilghiria) solata, Ariophania tranquebarica, and with a slight slit about halfway in Xestina ligulata, basileus, and chemic. The peculiar structure of the columellar margin is probably due to this mantle-lobe and the large left shell-lobe combined, the latter being tongue-like and extending far back, it would be close to and play around the umbilicus

With regard to the distribution of Sophina, it is an interesting point whether it is the remnant of a genus at one period more widely spread than it is at present along the narrow belt of the Tenasserim coast, or whether it is of more recent and local development. The former seems to me to be the most likely, although there is no Indian genus at present known with which it can be linked up. It is the associate, as Stoliczka points out, writing of the physical features of Moulmein, of several very peculiar and interesting genera, which are known now to range further than when he wrote. There is a large extent of country yet to be explored to the northward, and species related to Sophina may be looked for on the flanks of the great gneissic backbone of the Malay Peninsula, and away into the Shan country and Upper Burma?

[453. Sophina calias, Bs. (Helix) A M N. H (3) 11, 1859, p 472, id op cit (3) v, 1860, p. 26, Pfi (Helix) Mon Hel v, 1868, p 112; H & T C. I 1876, pl 147, figs. 2, 3; Newll, Namma (Sophina) Hand-l. 1, 1878, p 52

Sophina discordalis, Stol J A S B 1871, 2, p 258, pl 19, figs 5, 11, 12, Ifr Helix (Sophina), Mon. Hel vii, 1876, p 117, H. & T C I. 1876, pl. 147, fig. 7, Nevill, Hand-l 1, 1878, p 52

Sophina schistostelis, Bs (Helix) A M N. H (3) 11, 1859, p 473, (3) v, 1860, p 27; Pfr (Helix) Mon. Hel v, 1868, p in, id i c. vii. 1876, p 116, H. & T C I. 1876, pl. 147, figs 5, 6, Nevill, Namina (Sophina), Hand-l 1, 1878, p 52

Sophina calias, Stol J. A S B. 1871, 2, p 225, pl. 19, figs 1-4 & 7-9 (anatomy and shell)

Fig. 87, A, A'.

Shell narrowly umbilicated, depressedly orbiculate, solid, obliquely striated, pale horny, spire flat, apex slightly raised, obtuse, suture marginate; whorls 5, convex, moderately increasing, the last rounded at the circumference, below slightly convex; aperture broadly lunate, suboblique; peristome straight, acute, the columellar margin obliquely descending, thickened, slightly reflected, at base narrowly notched, extremity of notch keeled umbilicately, forming a gradual spiral receding within the narrow umbilicus

Large species. major diam. 15, min 135, alt. axis 6 mm.

Ordinary size . , , , 9, ,, 75 ,, ,, 4 ,, Hab. Near Moulmein at the Farm Caves and Tavoy (Theobald)
The specimens from Tavoy are very solid and milky white in colour. The adult shell always shows two periods of growth, the position of the old aperture showing as a varix on the last whorl.]

[454. Sophina schistostelis, Bs (Helix) A M N H (3) iii, 1859, p 478, (3) v, 1860, p 27, Pfr (Helix) Mon. Hel v, 1868, p 111, id t c vii, 1876, p 116, H & T (Sophina) C I 1876, pl 147, figs 5, 6, Nevil, Nanina (Sophina), Hand-I i, 1878, p 52 Sophina calias, Stol. J A & B 1871, 2, p 225, pl 19, figs 1-4 & 7-9 (anatomy and shell)

Vide fig 86, p 283, fig 57, B, B'

Shell perforate, globosely depressed, thin, smooth, irregularly transversely striate, translucent, shiny, pale horny, spire short, apex slightly elevated, obtuse, suture impressed and marginate; whorls 4½-5½, above and below slightly convex, rounded on the last; aperture subrotundately lunate; peristome thin, straight, columellar margin vertical, thickened slightly, forming with the basal margin of the peristome a deep notch or cleft, compressed into a sharp keel round the umbilicus and retreating within it.

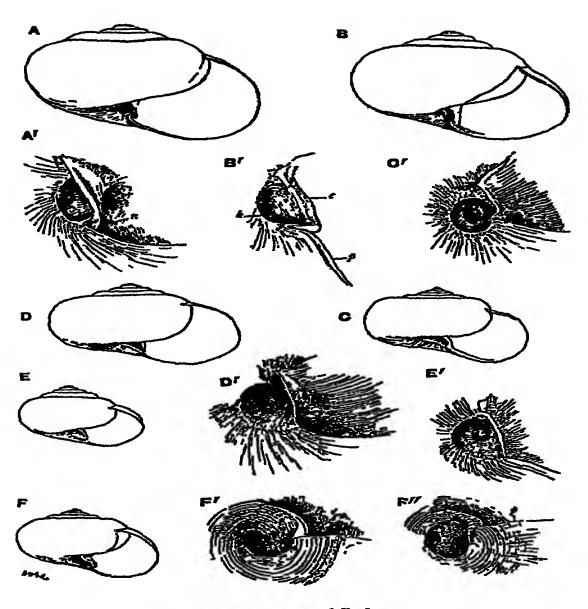
Specimen described major diam. 16, min 13.5, axis 8.5 mm.

(Specimen described by Benson)

Hab Near Moulmein.

This species can be determined at once by the deep cleft, which is longer and deeper than in any other species of the genus]

SOPRINA. 287



[Fig 87 —Species of Sophina

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A Sophina calias × 3
A' Columellar margin and noteli with umbilical keel of same × 8 25
B, B' Sophina schistostelis
C, C' discordalis
D, D' conjungens
E, E' forabilis, var benson:
F, F' forabilis
F'' showing noteli
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c, columellar margin , p, peristome , λ , umbilical keel , n, noteh]

[455. Sophina discoidalis, Stol. J. A. S. B. 1871, 2, p. 258, pl 19, figs 5, 11, 12, P/r. Helix (Sophina), Mon. Hel. vii, 1876, p. 117, II & T. (Sophina) C. I. 1876, pl. 147, fig. 7, Nevill, Namua (Sophina), Hand-I 1, 1878, p. 52
Fig. 87, C, C', p. 287.

Shell depressed, subdiscoid, openly umbilicated, circular in shape, thin, pale horny, sometimes with a rufous band near the periphery; whorls 5-5½, closely and regularly wound, slightly convex, transverse strip very minute and close, suture depressed, and below the suture spiral impressed lines not very distinct, apex a little prominent, aperture semilunate, subvertical, the columellar margin short, thickened, oblique, reflected slightly at the base, with a shallow notch, forming a pronounced sharp keel within the numbilicus, seen perspectively and regularly to the apex.

Sp B.M. major diam 105, min. 95, axis 45 mm.

Hab Moulmein Lamestone Hills, Ataran River (Theobald)

[456 Sophina conjungens, Stol J. A. S B 1871, 2, p 257, pl 19, figs 6, 13, Pf. (Hehr) Mon Hel vii, 1876, p 118, H & T. (Sophina) C I 1876, pl 147, figs 8, 9, Nevill, Nanina (Sophina), Hand-l 1, 1878, p 52
Fig 87, D, D'

Shell globosely orbiculate, slightly depressed, thin, transparent, openly umbilicated, sculpture none, transverse lines of growth; colour horny pale sienna tint; spire depressedly conic, suture shallow; whorls 5, very convex, tumid, increasing regularly; aperture ovately lunate, oblique, peristome thin; columellar margin nearly vertical, slightly reflected, thin, very feebly notched at base at junction of the peristome, forming an indistinct umbilical keel

Specimen in British Museum, from Stoliczka major diam 12, min. 101, alt axis 5 min.

Locality. South of Moulmein]

[457 Sophina forabilis, Benson, A M N H (3) 111, 1859, p. 389 (emend char), p 473, Pfr (Helix) Mon Hel v, 1868, p 112, H & T (Sophina) C I 1876, pl 147, figs 1, 4, Newll, Nanina (Sophina), Hand-l 1, 1878, p 52
Fig 87, F-F"

Shell semiglobosely conoid, very openly and perspectively umbilicated, transversely striate; sculpture under high power very fine longitudinal striation on the upper whorls, beneath and around the umbilical keel the strix become quite coarse and distant, colour horny brown; spire conoidly depressed, apex rising slightly, subobtuse; whorls 5½-6, convex, rather rapidly increasing, rounded on the periphery, aperture roundly and obliquely lunate; peristome vertical, acute; columella sinuate, somewhat thickened, at the junction with the peristome is a fold

or short close cleft forming a very sharp keel, continuous up the umbilicus

Size specimen figured major diam 8, min 7.5, alt. 4 mm Large spec in Brit Mus; ,, 9, ,, 85, ,, 4

Large spec in Brit Mus: ", "9, " 85, " 4 "

Hab. Damotha, near Moulmein Figured specimen from the Godwin-Austen collection. received from Stoliczka

This species may be known from all others of this genus by the coarse spiral struction on the basal side]

[458. Sophina forabilis, var. benson: Vide fig 87, E, E'

Shell globosely conoid, umbilicated, surface smooth, not polished; colour umber-brown, spire depressedly conoid, suture impressed, whorls 5, increasing regularly, the last two rather more rapidly, rounded on the periphery, aperture ovately lunate, oblique, columellar margin subvertical, very slightly thickened, forming a sharp angle with the peristome, but no notch, the angle continued perspectively as a blunt keel within the umbilious.

Size: major diam. 75, min. 65, height axis 4 mm

Hab. Damotha, near Moulmein (Stoliczka)

Three specimens of this shell received by me from Ferd Stoliczka in the same tube with S. forabilis, but the absence of striation in the umblical region and the different form of umblical keel are sufficient to distinguish the species—It is very close to S conjungens, but much smaller. Several examples named forabilis in the British Museum collection agree with this form]

Genus HEMIPLECTA.

Hemiplecta, Albers, Heliceen, 1850, p. 60, Godivin-Austen, Mol Ind 11, 1898, p 70.

Type, H humphreysiana, Lea, from Singapore [Fig 88, A-D] Range. Burma, Siam, the Malay Peninsula and part of the Malay Aichipelago. Species from the peninsula of India formerly referred to this genus are now known to belong to Arrophanta

Shell perforate or umbilicated, subterminate or depressed, rather solid, whorls regularly increasing; aperture lunate; peristome

obtuse, sometimes more or less thickened

Animal with both right and left shell-lobes developed, but small; dorsal lobes large, the left divided into two parts. Mucous pore large, sometimes with an overhanging lobe above. Foot divided

longitudinally beneath

In the generative organs the dart-sac is very large and cylindrical, the spermatheca small and pear-shaped, the retracted muscle of the penis attached at about two-thirds of the length from the distal extremity to the junction of the vas deferens, without any free execum. No kale-sac.

Radula long and broad, with many teeth in a row In H. humphi cysiana Godwin-Austen found 163 rows, each containing 125. 2 20.1.20.2.125 (147.1 147) teeth. The

median and admedian are almost triangular, without distinct lateral cusps. The outer laterals are unicuspid at first, but soon become bicuspid and towards the margin are small and narrow.

As the animals of the Burmese forms referred to Hemiplesta, with the exception of H. uter, are imperfectly known or unknown, it is doubtful whether all belong to the present genus

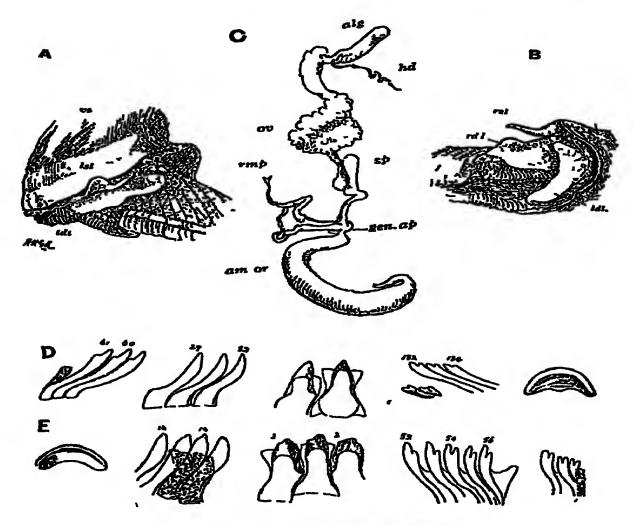


Fig 88 -Hemiplecta humphrcysiana

- Animal, spirit-specimen, viewed from left side ×18

 B Ditto, ditto, viewed from the anterior and lower side
- O Genitalia, natural size
 D Teeth of the radula, × 276, jaw, × 6

Hemiplecia uter

E Teeth of the radula, × 276, jaw, × 6.]

A. Subturbmate

459. Hemiplecta uter, Theobald (Helix), J A S B xxviii, 1859, p 305, Pfr (Helix) Mon Hel v, 1868, p 227, H & T (Helix) C I 1876, pl 50, figs. 7, 8, Nevill (Nationa), Hand-l 1, 1878, p 30, Godwin-Austen, Mol Ind 11, 1898, p 77, pl 82, figs 1-1 d (radula).

[Fig 88, E]

Shell openly perforate, depressedly turbinate, thin, yellowish white, ornamented with lines of growth obliquely crossed by small flexuous irregular ridges and furrows, which disappear a little below the periphery, the lower surface being smooth and finely decussated; spire conoidal, apex acute, suture impressed; whorls 5, slightly convex above, the last scarcely descending, keeled at the periphery, rounded below; aperture oblique, roundly lunate, about as broad as high; peristome thin, straight, columellar margin vertical above and triangularly reflected

Major diam 27, min. 24, height 17 mm.

Hab. Near Moulmein and hills west of Toungoo (Theobald).
Animal with a very small lobe above the mucous pore. Small shell-lobes to mantle. Teeth of radula similar to those of H humphreysiana. 77.38.10.1.10 38.77 (125.1.125)

B Depressed.

460. Hemiplecta undosa, Blf (Nanina) J A S B 1865, 2, p 68, Pfi (Helix) Mon Hel v, 1868, p 161, H & T (Helix) C I 1876, pl 3, figs 2, 3, Nevill, Nanina (Hemiplecta), Hand-l 1, 1878, p 47

Shell rather narrowly umbilicated, conoidly depressed, rather solid, whitish, in dead shells marked above by oblique striæ, crossed by irregular series of close spiral (longitudinal) impressed lines, smoother beneath, the concentric lines becoming fainter below the periphery; spire low, conoid, apex obtuse, suture impressed, whorls 5, rather rapidly increasing, convex above, the last broader, subangulate at the periphery, rounded beneath; aperture diagonal, roundly lunate, as broad as high peristome simple, straight, columellar margin oblique, slightly carried forward and reflected above.

Major diam 36, min 31, height 21 mm Hab Shan Hills, east of Mandalay, Burma.

This species somewhat resembles the Singapore H. humphreysiana in form and sculpture. Only dead decorticated specimens were originally obtained, but fresh shells may have a yellowish or brownish epidermis. Hauley's figure represents a shell with strong oblique sculpture, a distinct keel at the periphery, and yellowish in colour, and may represent a distinct species or variety

H. zimmayensis, Godwin-Austen, P. Z S. 1888, p. 241, from Zimmé (Chieng Mai) in Siam, is a large umber-brown species, 27

inches in diameter, and allied to the common Siamese Hemiplecta distincta, Pfi, of which it may be a variety. No specimens have hitherto been obtained within British territory in Tenasserim, but it is not improbable that, like other Siamese shells, it may be found

461. Hemiplecta? textrina, Bs (Helix) A. M. N. H. (2) xviii, 1866, p. 252, Pfi (Helix) Mon. Hel. iv, 1859, p. 58, Blf (Nanina) J. A. S. B. 1865, 2, p. 87, H. & T. (Helix) C. I. 1876, pl. 52, figs 2, 5, Nevill (Nanina), Hand-l. i, 1878, p. 32, Godwn-Austen (Macrochlamys), Mol. Ind. i. 1883, pl. 21, fig. 87 (sculpture)

Shell perforate, depressed to conoidly depressed, rather thin, pale rufescent to whitish horny, the whorls transversely stricted above and decussated with fine impressed spiral lines, smoother beneath, and the decussating lines gradually disappearing on the base towards the perforation, spire varying from very low to depressedly conoid, suture slightly impressed, whorls 5½-6½, flattish, gradually increasing, the last varying from subangulate to distinctly angulate at the periphery, generally slightly angulate, convex beneath; aperture slightly oblique, broadly lunate, peristome obtuse, slightly thickened and opaque white inside; basal margin almost straight, slightly arcuate, columellar short, sinuate, oblique, moderately reflected above.

Major diam. 29, min 25, axis 15 mm.

Hab. Western Pegu and Arakan as far north as Akyab.

The animal has a small lobe above the mucous caudal gland, and the foot is flatter than in Macrochlamys. Colour light grey,

genitalia and radula undescribed.

A large shell measures 36, 31, and 18 mm., a small one, with the spire higher than usual, 25, 22, and 144. Shells from the neighbourhood of Thayetmyo and Prome have the periphery much less angulate than those from Bassein.

This species and H theodori may possibly belong to Macrochlamys, but they are more probably members of the present genus

or nearly allied to it.

462 Hemiplecta theodori, Phil (Helix) Zeitschr Mal 1846, p. 191, Pf. (Helix) Mon Hel 1, 1848, p 70, id t c. vii, 1876, p. 122, H & T (Helix) C I 1876, pl 59, figs 7, 8

Shell openly perforate, depressed, sublenticular, pale yellowish tawny, rather thin, subcostulately striated, the striæ decussated by spiral (longitudinal) impressed lines; spire low, apex obtuse, suture impressed; whorls 6-6½, convex above, the last bluntly angulate at the periphery, descending near the mouth in adults, moderately tumid beneath; aperture oblique, almost diagonal, broadly lunate, peristome white, slightly thickened inside, outer margin broadly sinuate, columellar curved, oblique, briefly reflected above

Major diam (of adult from Ataran) 261, min. 24, height

13 mm Another specimen measures $24 \times 21 \times 10\frac{1}{4}$; an immature shell from Mergui $27 \times 23\frac{1}{2} \times 13$.

Hab Mergui (Philippi), Yanglaw, Tenasserim valley; Ataran

Valley (Theobald), top of Muleyit (Fea)

The type described by Philippi appears to have been immature, as was certainly the shell figured by Pfeiffer in Mart & Chemn Conch-Cab. 2nd ed. no 687, pl 110, figs. 1-3 The two specimens obtained by Theobald from Ataran, now in the British Museum, are probably the first adult shells described.

This species is distinguished from *H textrina* by much coarser sculpture, descending last whorl, and more oblique and small

aperture.

463 Hemiplecta ² gordoniæ, Bs (Helix) A M N H (3) x1, 1863, p 87, Pfr (Helix) Mon Hel. v, 1868, p 402, H. & T (Helix) C I 1876, pl 27, hg. 42.

Shell perforate, orbiculate, depressed, rather thin, whitish, above obliquely striated on inner whorls, plicate on outer whorls, beneath smooth, radiately striated, and decussated by subdistant concentric impressed lines, spire almost flat, apex slightly raised, obtuse, suture impressed, whorls 7, slowly increasing, slightly convex, outer whorls concave outside near suture, the last sharply and compressedly keeled, not descending; aperture nearly vertical, broad, angularly lunate; peristome obtuse, white, slightly thickened inside, basal margin arcuate, columellar short, slightly reflected at perforation.

Major diam 33, min. 30, axis 11 mm.

Hab Nidoung Toung, Ataran Valley, near Moulmein.

The affinities of this species are very doubtful, and it may belong to the Helicidæ

464. Hemiplecta? auriettæ, Tapp Canefii, Nanina (Macrochlamys),
Ann Mus Civ Gen xxvii, 1889, p. 318, pl. 8, figs 4, 5, 6

Shell narrowly umbilicated, suborbiculately depressed, subangulate at the periphery, rather thin, closely and strongly decussated above, silky, olivaceous, glossy beneath, paler, and radiately
structed, spire but little raised, apex obtuse; whorls 6½, slowly
increasing, the last not descending, slightly flattened at the base;
aperture slightly oblique, regularly ovately lunate, peristome
simple, acute, margins remote, columellar oblique, briefly reflected
over the umbilicus above at its insertion.

Major diam. 24, min 21, height 10½ mm.

Hab. Muleyit, Tenasserim, at about 6000 feet elevation (Fea, Beddome).

The suture is lightly impressed and not as represented in the

figure. The sculpture resembles that of Euplecia undica

The affinities of the species are doubtful; it may belong to the Helicides.

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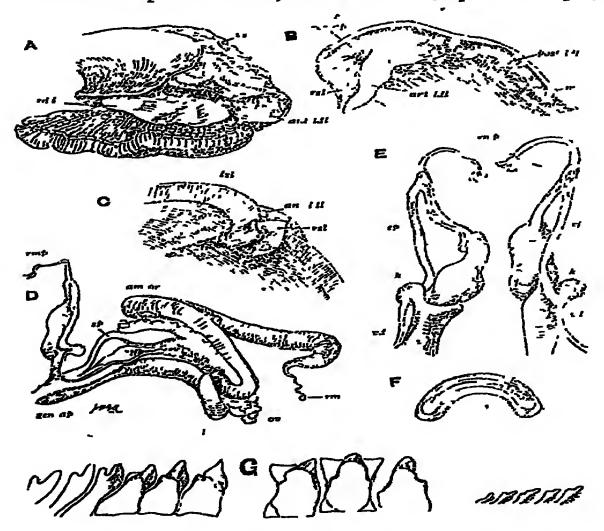
Genus HAUGHTONIA

Subgenus Haughtonia, Goduin-Austen, Mol Ind ii 1899, p 120

Type, II. conferta, Pti

Range. The Andaman Islands

Shell periorate, subglobose, rather solid, with a thick epidermis and distinct spiral striction, whoils about 5, aperture oblique,



[Fig 89 — Haughtonia conferta

- A. Animal, viewed from the right side × 17

 B. The mantle-edge and dorsal lobes detached × 15

 C The mantle-edge in vicinity of the respiratory original showing the rudimentary right shell-lobe × 68 rudimentary right snell-lobe enitalia × 19.
- Genitalia
- E The male organ, from two different sides × 14
- \times 6 F The jaw
- G Teeth of the radula \times 188.]

peristome straight, in one plane, slightly thickened within,

columellar margin with a small tooth-like swelling

Animal with a short foot behind, the sole not divided, mucous pore large, no overhanging lobe. Right shell-lobe rudimentary, left wanting, anterior left dorsal lobe distinctly separate from the posterior. Male organ bent on itself, to which bend the retractor muscle is attached, a long tube connecting this bend with the small globose kalc-sac; penis distally to the bend forming a short tube leading to a swollen bulbous portion, to which succeeds a short broad sheath adjoining the genital aperture. Dart-sac or amatorial organ long and cylindrical, spermatheca small, pear-shaped, on a stalk.

Radula with a broad median row of large teeth, somewhat as in Hemiplecta densa, but with fewer outer laterals.

Median tooth almost straight-sided, with only an indication of lateral cusps; inner laterals without inner cusps and with outer

cusps slightly developed, outer laterals bicuspid.

This genus differs from *Hemiplecta* in the foot not being divided beneath, in the want of shell-lobes, the characters of the male organ, and the much less numerous lateral teeth on the radula The shell recalls certain Seychelle and Mascarene species (Stylodon unidentata, Erepta stylodon), but the animals do not appear to have been described.

465 Haughtonia conferta, Pf. (Helix) P Z S 1856, p. 328, ed Mon Hel iv, 1859, p 183, Godwn-Austen (Rhyssota), J A S B 1882, 2, p 70, pl 5, fig 6 (animal), ed Helix (Rhysota), P Z S 1895, p 442, ed Mol Ind ii, 1899, p 120, pl 99, figs 1-8 (ani-

mal and anatomy)

Helix haughtom, Bs A M N H (3) x1, 1863, p 87, Pfr Mon

Hel v, 1868, p 92, H & T C I 1876, pl 28, fig 3, Stol

J A & B 1870, p 87, Nevill, Namma (Rhyssota), Hand-l. 1,

1878, p 46

Rhyssota chambertinii, Tryon, Am Jour Conch v, 1869, p 109, pl 19, fig. 2.

Shell perforate, subumbilicate, depressedly conoidal, subturbinate, solid, whitish with a thick yellowish-brown epidermis, sculptured with oblique lines of growth and fine, close, flexuous spiral strike above and below, spire conoidal, apex obtuse, suture impressed, whorls 5, slightly convex above, the last flatter, angulate at the periphery, rounded beneath, compressed around the umbilicus; aperture diagonal, roundly lunate, subquadrangular; peristome in one plane, obtuse, slightly thickened inside, the columellar margin oblique throughout, thickened and bearing a small tooth in towards the base, briefly reflected above

Major diam 34, min 29, height 19 mm

Hab South Andaman Island, Mount Harriet, hving on the ground.

["Animal dark brown, reddish at the pedicles. Mantle thick, greyish brown, freckled with white, body very rough, pedal row very distinct and the elongated tubercles whitish, basal edge pale greyish brown. Tail-gland distinct, surrounded by a swollen edge" (Stoliczka, attached to his drawing of the animal)]

[Genus STAFFORDIA.

Staffordia, Godwin-Austen, Mol. Ind. ii, 1907, p 184

Type, S. daflaensis, Godwin-Austen.

Range Dafla Hills

Animal. Foot pointed, no gland, peripodial margin simple with a narrow pale margin, right and left shell-lobes present, both small Generative organs dart-sac small, globose, with a long cord-like attachment to the coronal gland, penis simple, spermatheca long. Radula with aculeate laterals

The Dafia Hills, in which this very aberrant mollusk was found, he on and north of lat 27° and between long 93° 10′ and 93° 50′, at the base of the Eastern Himalaya. Nothing like it

has been as yet found in any part of India or Burma.

The shell of this species is an instance of how shell-character may be misleading in classification. So like is it to many species of true *Macrochlamys*, any conchologist would place it in that

genus.

In a paper on the Helicidæ (Zonitidæ) collected during the expedition into the Dafla Hills, Assam (Journ Asiat Soc Bengal, vol. xlv, pt 2, 1876), occurs the first notice of the type species

[466 Staffordia daflaensis, Godwin-Austen
Helix lubrica, Bs?, Godwin-Austen, J. A & B xlv, 2, 1876,
p 311, pl 8, fig 9, id (Macrochlamys) Mol Ind 1, 1883, pl 21,
fig 6 (sculpture), id t c 11, 1907, p 185, pl 113, figs 1-1;
Macrochlamys shengorensis, Godwin-Austen, Mol Ind 1, 1883,
p 102, pl 22, fig 5 (young shell)

Original description.—Shell depressedly tumidly conoid, umbilicated, solid, rather flat on base Sculpture very regular, longitudinal, sharply defined, broad-ridged ribbing Colour rich olivaceous with ochie tint Spire low, sides convex Suture shallow, adpressed. Whorls 6, rapidly increasing, the last rounded, aperture broadly ovate, oblique, milky white within; peristome acute, sinuous above and slightly so below, much reflected at umbilical margin; columellar margin very oblique and descending.

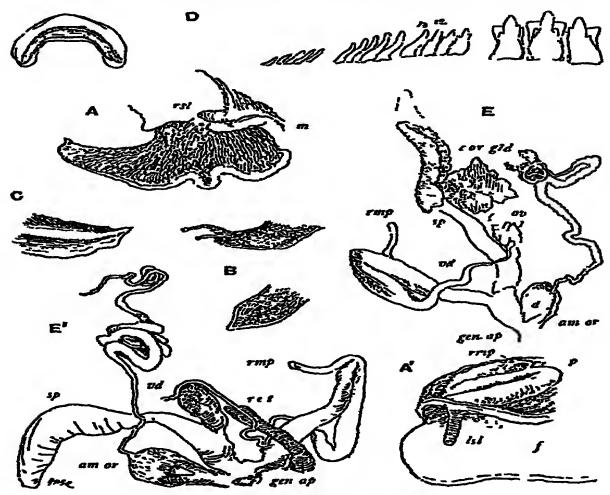
	Major diam		Minor diam	Alt axis.	Alt. b-w.
14	Largest size: 23	23 5	20 0	94	78 mm.
	Smaller size	188	1162	8-0	58 "

Hab. Shengorh Peak, Dafis Hills, 7000 ft. (Godwin-Austen).

It was an abundant species in the Daffa Hills, varying much in colour and size, often being of a pale ochraceous-grey tint On Toruputu Peak it occurred also with the same characteristic

sculpture, but thinner in structure.

"Animal. Fore part of foot and head, as well as the tentacles, dark slate, extremity of foot pointed (no gland visible, fig 90, B), pale grey, edged light fleshy; sole of foot dark orange, mantle very slightly reflected in front, with no tongue-shaped piocess "Length 20"; tentacles 05"; shell, major diam 095""



[Fig 90 -Staffordia daflacusis.

A Animal from right side, showing the right dorsal lobe ×34.

A Animal from left side, the left dorsal lobe and part of the branchial wall removed, showing the male organ and position of its retractor muscle attachment ×34

Head and extremity of foot, from drawings from life

Extremity of foot, from spirit-specimen Jaw, × 9, and teeth of radula, × 270

Generative organs, × 35 cor qld, coronal gland, d, dart ×35 First specimen dissected]

The only part of this original description which was wrong relates to the tongue-shaped process or shell-lobes. these were seen to be present in the second specimen soaked out, they are small, particularly the right, and might easily be overlooked in life. This bad clearly a pointed foot, not divided below as in Macrochlamys, with an indistinct central fold, no peripodial grooves, very dark grey, a rather smooth surface with a pale narrow peripodial border.

From the two soaked-out specimens I have been able to make out much more of the genitalia than the first alone presented,

which was incomplete (fig 90, E')

The generative organs are most interesting and fall in with the dissimilarity to Zonitoid genera, such as Mac ochlamys, presented in the external characters. They are altogether different from any species of Indian Land Mollusca I have hitherto seen, particularly in the form of the dart-sac The penis is a simple tube bent on itself near the short retractor muscle The sperma-The oviduct in both cases was destroyed, theca is long and ample but in the second specimen the junction of the vas deferens was intact. The dart-sac is short, rounded at the distal end, and on being opened out a blunt leathery solid dart was disclosed. Attached to the head of the dart-sac at its central point is a tube of great length: in the first specimen this is thin at first, then swelling out much larger in several coils, and again becoming thinner, in the second specimen this rope-like tube is more uniform in size, much coiled together where it is attached to a glandular mass, this was much broken up, but a large portion was seen enveloping a part of the spermatheca.

This long rope-like attachment to the dart-sac, which in the first specimen had no attachment, left very much that was doubtful as to what it could be; the second specimen clears this up, and we are presented with an amatorial organ similar in its main points to that met with in the genus Dyakia, particularly in that of D. striata var., described by me in the 'Proceedings of the Malacological Society,' vol vii, pt. 2, June 1906. This is an extremely interesting point of resemblance—confined to one organ, and yet not shared in by several important characters. In Dyakia there is a large mucous pore, and the peripodial margin is fringed as in the Zonitade generally. There are no shell-lobes either. There are minor details in the genitalia which may be noted the spermatheca in Dyakia is very small, the dart is calcareous. The radula is of the same type in both, the laterals being aculeate. The penis in both is of the same simple type. The radula of the Daffa form has 98 rows of teeth and the formula.

55 . 1 . 12 , 1 . 12 . 1 . 55 68 . 1 68

The centre tooth is tricuspid, the admedians also tricuspid, the inner cusp high up, the outer one lower down, the 13th tooth

has no notch All the laterals are shortish aculeate teeth, becoming very small on the margin

The jaw is large, solid, convex on the edge, and rather straight

in the centre as opposed to the usual central projection]

[467. Staffordia daflaensis, vai., Godwin-Austen, Mol Ind ii, 1907, p 185, pl 113, fig 2 (shell)

Original description:—Shell. sculpture coarse longitudinal ribbing, rather irregular, colour ochraceous olive-green Size maj diam. 164, min. 148; alt axis 80, alt b-w 65 mm.]

[468. Staffordia toruputuensis, Godwin-Austen, Mol Ind 11, 1907, p 185, pl 113, fig 3 (shell).

Original description —Shell not fully grown, sculpture very smooth, with a thick shining epidermis with indistinct striction, colour light ochraceous olive-green.

Size: maj diam 165, min 140, alt axis 725 mm

Hab Toruputu Peak, Dafia Hills

[469 Staffordia staffordi, Godwin-Austen, Mol Ind 1, 1883, pl 21, fig 14 (sculpture); id t c 11, 1907, p 185, pl 113, fig 4 (shell)

Original description —Shell umbilicus almost hidden, moderately solid, with a thick epidermis, very globosely conoid, rounded below; sculpture small, elongate papillæ arranged longitudinally, and differing from all the other species collected in the Datia Hills, colour olivaceous othre, spire low; suture shallow, whorls 5, sides convex above, rather flattened on the periphery of the last whorl; aperture lunate, nurrow, subvertical, milky white within, rounded below, peristome thin, slightly sinuate below, and nearly vertical near the columella

Size maj diam 152, min 132; alt axis 78, alt. b-w. 60 mm

Hab Toruputu Peak, Dafla Hills, 7000 ft

The shell is not adult, but the sculpture is so peculiar I have been obliged to designate the species, which I have named after the Brigadier-General who commanded the Expedition]

Genus DYAKIA.

Dyakıa, Godwin-Austen, P Z S 1891, p 29, pl 5, figs 4-4c, 5-5b (generative organs)
Semperia, Godwin-Austen, Mol Ind 11, 1898 p 82.

Type, D hugonis, Pfr., from Borneo

Range From Tenasserim throughout the greater part of the

Malay Archipelago.

This genus is chiefly distinguished from Ariophanta by the characters of the radula, and especially by having bicuspid

marginals, each with two subequal points. The central tooth is either tricuspid with large lateral cusps close to the apex, or devoid of lateral cusps. Lateral teeth bicuspid. In a specimen of D reti orsa there were on each side 12 inner lateral teeth and 45 marginals. The jaw had no inner median projection.

[The generative organs, as shown in the type, are peculiar, the amatorial organ baving a bunch of secretory glands at the free end

and a long slender calcareous dart ?

470 Dyakia? retrorsa, Gould (Helix), Bost Jow N. II 18, 1844, p 455, pl. 24, fig 4. Pf. (Helix) Mon Hel 1, 1848, p 76, ed. t c vii, 1876, p 128, H & T (Helix) C I 1876, pl 25, fig. 6, Godwin-Austen (Ariophanta), Mol Ind 1, 1883, pp 183, 136, pl. 34, figs 4-8, ed (Semperia) t c. ii, 1898, p 82, v Mart Namma (Hemiplecta), Jour Linn Soc VII, 1889, p 161

Helix saccate, Pfr. P Z S 1854, p 49, ed Mon Hel 18, 1859, p. 30, ed t. c. vii, 1876, p 96, Godwin-Austen, J A S B 1880, 2, p. 153

Shell smistral, narrowly umbilicated, thin, obliquely striated and marked, on the last whorl especially, above and below, with fine spiral, slightly undulating wrinkles, spire conoidal, with an acute apex, suture emarginate; whorls 2½, rapidly increasing, flatly convex above, the last compressedly keeled at the periphery, swollen beneath, not descending, aperture diagonal, ovally lunate, peristome thin.

Major diam. 45, min 36, height 23 mm,

Hab. Tennsserim, Tavoy and Mergui, Mergui Archipelago [The generative organs of D.? retrorsa have not yet been examined, and it is to be seen whether they conform to the sinistral type species (D. hugonis of Borneo) or not.]

[Dr. Blanford's manuscript included the genera Parmacella and Vitrina, both of which I consider will be better brought into the volume on the Helicide, and after Trochomorpha, which I trust may follow next in the 'Fauna of British India' (Mollusca) In the genus Vitrina are included three species pellucida, a typical species, and two others which cannot be said to be so, viz. papillaspira, Godwin-Austen, from the Khasi Hills, and canefrize birmanica, Tapparone Canefri, it was this naturalist who considered a species obtained by M Fea at Bhamo to be the same as Austenia papillaspira. I would call attention to the fact that the Bhamo shell was never compared with the type in my collection, and that it is by no mean's certain the animals are alike, that of the Khasi form being unknown, while the Bhamo species is described as having no mucous pore, and for this reason alone

it was placed in Vitrina For the present, and until more is known of the Khasi Hill species, it is safer to place it in the genus Cryptaustenia, after No 286, p. 188.

I cannot believe these tropical forms are related to, or that their auatomy is comparable with, that of the Palæarctic genus Vitina, on the ground of a single character, viz a pointed foot

William Theobald (J A.S B 1870, p 401) describes a Viti ma ataraness from the river of that name in Martaban and which Nevill placed, I think rightly as far as the knowledge we possess, in the genus Viti mopsis of Semper, Hand-l 1, p 17 I have a single specimen of this species received from Theobald, of which I have made a drawing It has a long very pointed foot, and apparently no mucous gland; but as in some of these forms the foot tapers to an overhanging lobe, very much concealing the slit of the mucous gland below, it is very difficult in a badly-preserved hardened spirit-specimen to tell whether a mucous pore is present or not ataraness has ample right and left shell-lobes. This being the only specimen known, except the single one in the Calcutta Museum, I have not attempted to cut it up]

APPENDIX.

To follow No. 286, p. 188.—

286 a. Cryptaustenia? papillaspira, Godwin-Austen (Austenia), Mol Ind 1, p 153, pl 87, figs 4-4 b (1883), G Tapp Canefri (Helicarion), Ann Mus. Civ Gen xxvii, p 316 (1889)

Shell depressedly subglobose, very thin, transparent, smooth, polished, light horny; spire scarcely raised, but apex prominent, nipple-shaped, suture slightly impressed; whorls 3, convex, aperture oblique, lunately oval, margins converging, upper arcuate, columellar broadly sinuate.

Major diam 10½, min 8, height 5½ mm.

Hab. North Khasi Hills (Godwin-Austen); Bhamo (Fea). This differs from allied forms in the raised prominent apex.

According to Signor Canefri, this has no mucous pore, but the tail ends in a point. The animal jumps about when disturbed, as salius does.

*286 b. Cryptaustenia? canefrii.

Vitrina birmanico, Tappai one Canefri, Ann. Mus. Civ. Gen xxvii, p 316 (1889), nec Philippi.

"Shell imperforate, globose, thin, pellucid, very polished, pale amber; apex slightly exserted, obtuse; whorls 4, irregularly

wound, the last large, globose, all separated by a deep suture and an impressed serrulate line, surface smooth, marked by striss and obsolete waved furious throughout its length, aperture round, lunate, broad, columellar margin incurved, slightly reflexed at the base

" Major diam. 10, min. 7% mm.

"Animal blackish grey above, anterior lobes with black lines, sole of foot pale, often divided by a paler median zone" (T. Canefri, in Latin.)

Hab Near Bhamo.

[The next two species were included in Macrochlamys by Blanford I place them here because planiuscula certainly is more likely to belong to the Helicidæ Until the animals are examined it is impossible to know what their affinities are]

Depressed or conordly depressed

Longitudinally streated

Macrochlamys? anonæ, Godwin-Austen, Mol Ind 1, 1883, p 91, pl 14, hg 8, 11, 1898, p 48

Shell openly perforate, subumbilicate convexly depressed, rather solid, finely striated longitudinally under the microscope, yellowish brown; spire convex, suture slightly impressed; whorls 32, convex, the last rounded at the periphery and moderately convex beneath, aperture oblique, lunate; peristome obtuse, columellar margin oblique.

Major diam 11, height 06 mm

Hab. Calcutta; found on custard-apples

The description is from the types in the British Museum (Godwin-Austen collection) It is possible that they are immature

Shells not exceeding about 6 millimetres (a quarter of an inch) in diameter. (Generic affinities often doubtful)

Sul globose or subturbinate

Smooth.

Macrochlamys ⁹ planiuscula, Hutton (Helix), J A S B vii, 1838, p 218, Pfi (Helix) Mon Hel 1, 1848, p 60, H & T (Helix) C I 1876, pl 32, figs 7, 10, Godwin-Austen, Mol Ind 1, 1883, p 88, pl 16, fig 7

Shell obtectly perforate, subglobosely depressed, smooth, without sculpture of any kind, translucent, scarcely polished above, more

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so beneath, light brown; spire convexly conoidal, suture slightly impressed; whorls 4½, convex, slowly increasing, the last rounded at periphery, turned beneath, aperture subvertical, lunate; peristome thin, basal margin arcuate, columellar oblique, reflected, covering the perforation.

Major diam 25, min. 23, height 15 mm

Hab Simla, Landour, Mussoorie, amongst dead leaves (Godwin-Austen)

The description is taken from a Mussoone specimen.

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